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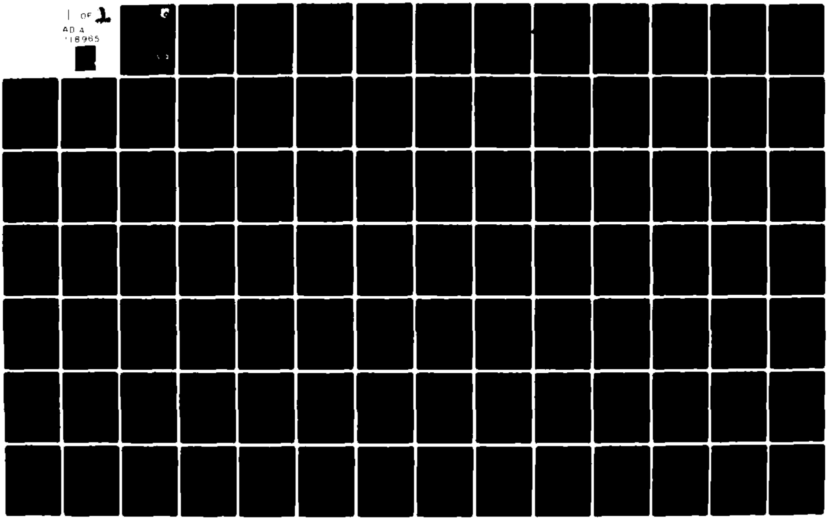

AFWAL-TR-81-3094

A USER'S MANUAL FOR A COMPUTER PROGRAM TO PREDICT FATIGUE CRACK GROWTH ON FLIGHT-BY-FLIGHT BASIS (FLTGRO)

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This technical report has been reviewed and is approved for publication.

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FOR THE COMMANDER:

Olsen for
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PREFACE

This report presents the description of a computer code which used the spectrum characterization methods developed in a research program entitled "Improved Methods for Predicting Spectrum Loading Effects." This program was administrated by the Flight Dynamics Laboratory of the Air Force Wright Aeronautical Laboratory, Wright-Patterson Air Force Base, Ohio, under Contract F33615-077-C-3121, Project 2401, "Structural Mechanics" Task 240101, "Structural Integrity for Military Aerospace Vehicles," Work Unit 24010120. R.M. Engle (AFWAL/FIBEC) was the Air Force project engineer.

This research program was primarily conducted by personnel from the Fatigue and Fracture Mechanics Group, Dynamics Technology, Structure Systems, supervised by George E. Fitch, Jr., supervisor, Joseph S. Rosenthal, manager, and Dr. Leslie M. Lackman, director. James B. Chang was the program manager and principal investigator. Edward Klein participated in the original development of this computer code. The spectrum characterization procedure used in this computer code was developed in Phase I of this research effort by Drs. Masanobu Shinozuka and Rimas Vaicaitis.

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Section I

INTRODUCTION

Current military standard MIL-STD-1530A "Aircraft Structural Integrity Program, Airplane Requirements"(1), states that two major activities designed to focus attention on each potential crack problem shall be included in the force management task. They are the Force Structural Maintenance (FSM) Plan and the Individual Airplane Tracking (IAT) Program. In addition, force management activities also include the loads/environmental spectral survey (L/ESS), updating the design analysis, developing inspection and repair criteria, and forming a structural strength survey.

The objective of the IAT program is to predict the potential crack growth in critical areas of each airframe, keyed to crack-growth limits, damage-tolerance limits, inspection times, and economic repair times. In the IAT program, an individual airplane tracking analysis method which establishes and adjusts inspection and repair intervals for each critical area of the airframe, based on the individual airplane usage data, must be developed suited for a particular aircraft system. The damage-tolerance and durability analysis and associated test data are used to establish the tracking analysis method. This tracking analysis provides the capability to predict crack-growth rates, time to reach the critical crack sizes, and crack size as a function of total flight time and aircraft usage data.

According to a survey conducted by the University of Dayton/Lockheed/Vought team, there are about 11 IAT methods being used in the IAT programs of 25 aircraft systems in the Air Force inventory. Among them, five methods are based on crack-growth analysis(2). The common practice is to employ a cycle-by-cycle crack-growth computer program to compute the crack growth for a flight or a number of flights.

From the economical point of view, the use of a cycle-by-cycle crack-growth computer code to compute the crack growth in the IAT program is definitely not cost effective. This is not only because the cycle-by-cycle crack-growth analysis consumes too much computation time, resulting in excessive computer cost, but also because there is no need for an accurate representation of the crack-growth behavior on the stress-level-by-stress-level basis for performing individual airplane tracking. Furthermore, it is highly desirable to operate the crack-growth analysis code on a variety of computer systems. It is even more desirable that such codes can be operated on the onboard type of minicomputers. Capacities of such computer systems prevent the use of the sophisticated cycle-by-cycle growth method.

It is for those reasons a fatigue crack-growth prediction procedure which uses two random spectrum characterization methods developed in phase I of this research effort, "Improved Methods for Predicting Spectrum Loading Effects" [3], was formulated. These two methods were identified as Method I and Method II in Reference 3. Method I is used to develop equivalent load spectra in terms of constant-amplitude stress histories (one cycle per flight). Method II is used to characterize each mission segment in a flight by a constant-amplitude load segment; a flight is assumed to consist of constant-amplitude mission segments.

A computer code, FLTGRO, was developed in the second phase of the aforementioned research effort. Both Method I and Method II have been implemented into FLTGRO. It has been subsequently used in providing analytical analytical predictions on 41 random flight spectrum test cases. Analytical predictions were correlated with the test data. Very good correlations were shown. Results of the test data correlations were documented in the final report of this program [4]. This report presents the description of the two spectrum characterization methods implemented in FLTGRO and provides detailed instructions to the user for executing the FLTGRO program.

Section II

TECHNICAL DISCUSSION

The crack-growth prediction methodology implemented in this computer code uses two spectrum characterization approaches. One approach, identified as Method I, is able to characterize the random flight spectrum or the ordered flight spectrum into the equivalent constant-amplitude loadings in one-cycle-per-flight format. The second approach, identified as Method II, is able to represent each flight segment in a flight such as climb segment, maneuver segment, descent segment, etc, by a constant-amplitude load segment. A flight is then assumed to consist of several constant-amplitude segments as shown schematically in Figure 1. The following are brief descriptions of the necessary steps required for these two approaches. Refer to Reference 1 for a detailed description of each method.

2.1. METHOD I - ONE-CYCLE-PER-FLIGHT CRACK-GROWTH PREDICTION METHOD

a. Generate sample stress histories for all missions and mission segments considered in certain combinations. Repeat the procedure N_A times to produce N_A consecutive sample flight spectra which is called a unitblock.

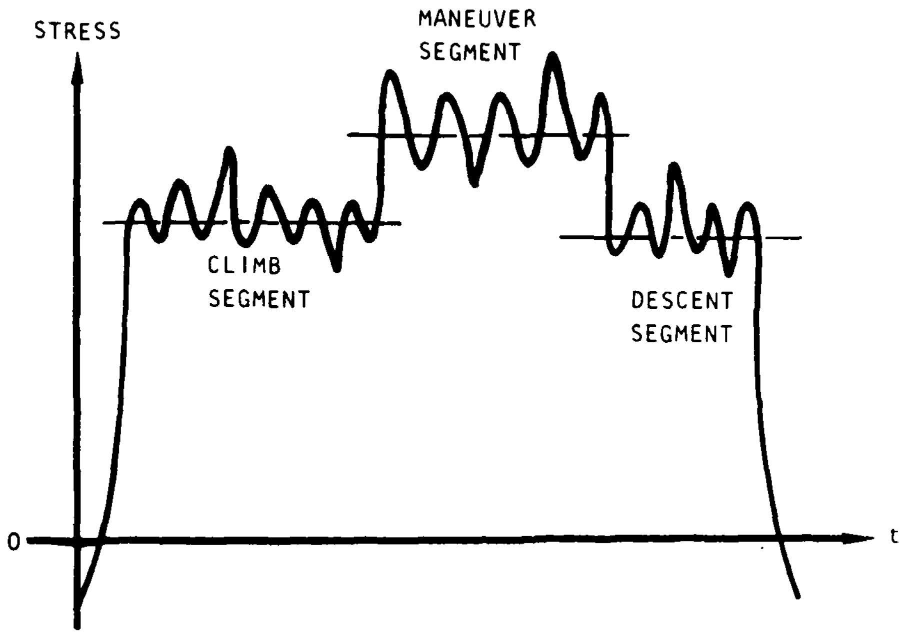
b. Use a cycle-by-cycle crack-growth analysis computer routine to evaluate the crack growth Δa due to the unitblock flight spectra under a prescribed number of different values of initial crack size a_o. Then, calculate $da/dF = \Delta a/N_A$.

c. Establish the following relationship on the basis of the foregoing numerical results:

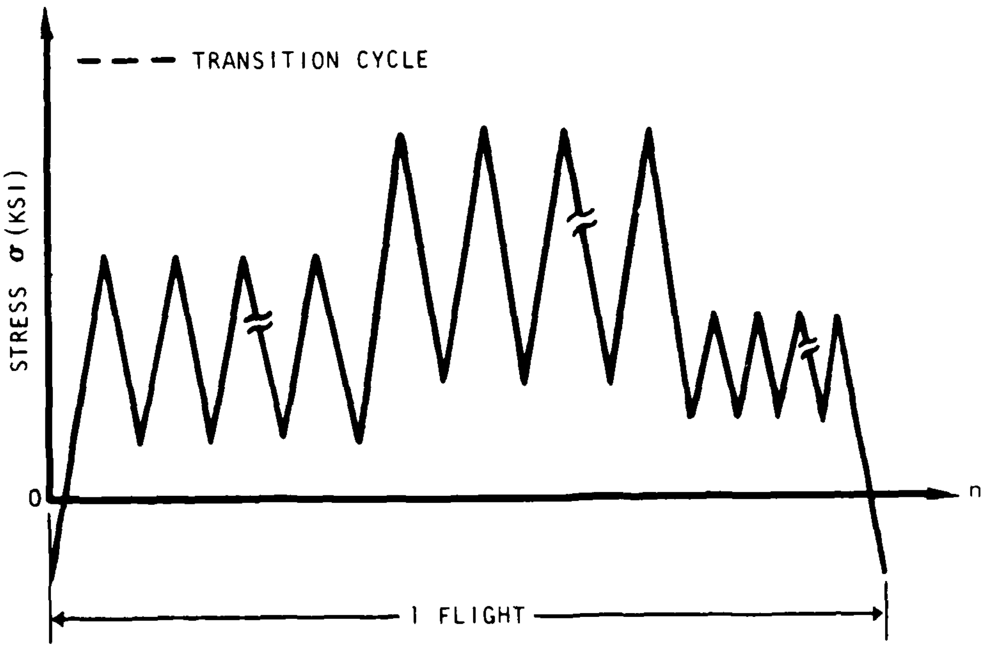
$$da/dF = C(\bar{K})^{\lambda}$$

where K is a measure of the stress intensity factor representing the overall effect of the unitblock on the crack growth. In a mathematical form, $\bar{K}$ is written as

$$\bar{K} = (\overline{\Delta\sigma^{b}})^{1/b} \cdot (a)$$



(a) RANDOM FLIGHT



(b) MULTISEGMENT LOAD

Figure 1. Spectrum Schematic

where $(\overline{\Delta\sigma^b})^{1/b}$ represents the statistical average of the bth power of the stress range $\Delta\sigma$ in the stress history and $\psi(a)$ is a function of crack size and other geometries; e.g., for a center-through crack in a plate under tensile load,

$$\psi(a) = \sqrt{\pi a} \quad \sqrt{\sec(\pi a/W)}$$

d. Plot da/dF against $\overline{K}$ for a number of different values of crack size a on a double logarithm scale. Then determine the two parameters C and λ. Each of the flight spectra representing a particular combination of the stress parameters with the rate of crack-growth evaluated is then replaced by a constant-amplitude stress spectrum with the equivalent rate of crack growth.

e. Repeat the same procedures for other combinations of stress parameters, resulting in corresponding values of C, λ, and $(\overline{\Delta\sigma^b})^{1/b}$ and also in corresponding equivalent constant-amplitude stress spectra. Thus, obtain a number of sets of parameters

$$\left[C_1,\ \lambda_1,\ (\overline{\Delta\sigma^b})_1^{1/b}\right],\ \left[C_2,\ \lambda_2\ (\overline{\Delta\sigma^b})_2^{1/b}\right],\ ---$$

and a number of growth rates applicable to each of the particular stress parameter combinations.

$$(da/dF)_1 = C_1\ (\overline{K}_1)^{\lambda_1}$$

$$(da/dF)_2 = C_2\ (\overline{K}_2)^{\lambda_2}$$

$$\vdots$$

$$(da/dF)_N = C_N\ (\overline{K}_N)^{\lambda_N}$$

where N is the total number of stress-parameter combinations to be considered. Hence, the problem of mission mix and mission sequence can be solved by choosing those growth-rate equations pertinent to the missions in the mix and applying them in the sequence corresponding to the mix.

f. The crack-growth life (F) in flights is obtained by the modified modified linear approximation damage accumudation technique.

2.2. METHOD II - MULTISEGMENT-PER-FLIGHT CRACK-GROWTH METHOD

The one-cycle-per-flight approach may not be appropriate for the highly maneuverable fighter-type aircraft. Hence, a multisegment-per-flight crack growth methodology was developed. Figure 1 schematically illustrates the conversion of the random flight spectrum to the multisegment-per-flight spectrum.

The multisegment-per-flight crack-growth methodology also uses the analytical procedure as does the one-cycle-per-flight, except the crack-growth rate is on a cycle-per-segment (da/dS) basis rather than a cycle-per-flight (da/dF) basis. The following are brief descriptions of the necessary required steps:

a. Generate sample stress histories for a specific flight segment such as a manuver segment; repeat the procedure N_A times to produce N_A consecutive sample flight segments (a uniblock).

b. Use a cycle-by-cycle crack-growth computer program to calculate the crack growth Δa due to the unitblock flight segment starting from a prescribed initial crack size a_o; then, determine $da/ds = \Delta a/n_i$. Repeat the procedure for a predescribed number of different a_o values.

c. Establish the following relationship on the basis of the aforementioned results:

$$da/ds = c\ (\overline{K})^{\lambda}$$

where $\overline{K}$ is the measure of the stress intensity factor representing the overall effect of the unitblock on the crack growth. In a mathematical form, $\overline{K}$ can be represented by

$$\overline{K} = (\overline{\Delta\sigma^b})^{1/b}\ \Psi(a)$$

The term $(\overline{\Delta\sigma^b})^{1/b}$ is the statistical average of the b-th power of the stress range, $\Delta\sigma$; $\Psi(a)$ is a function of crack size and other geometrical parameters.

d. Plot da/ds against $\bar{K}$ on a double logarithm scale; then, determine the two parameters C and λ. Choose either the appropriate value of $\bar{\sigma}_{max}$ or $\bar{\sigma}_{min}$ and then calculate the corresponding $\bar{\sigma}_{min}$ or $\bar{\sigma}_{max}$ based on $(\Delta\bar{\sigma}^b)^{1/b}$ value, resulting in the corresponding value of C, λ, and $\bar{\sigma}_{max}$, $\bar{\sigma}_{min}$ of the equivalent constant-amplitude flight segment.

e. Repeat the same procedures for other flight segments and thus obtain a number of sets of parameters

$$\left[C_1, \lambda_1, \bar{\sigma}_{max_1}, \bar{\sigma}_{min_1}\right], \left[C_2, \lambda_2, \bar{\sigma}_{max_2}, \bar{\sigma}_{min_2}\right], \ldots$$

and a number of growth rates applicable to each of the particular flight segments

$$(da/ds)_1 = C_1 \, (\bar{K}_1)^{\lambda_1}$$

$$(da/ds)_2 = C_2 \, (\bar{K}_2)^{\lambda_2}$$

$$\vdots$$

$$(da/ds)_i = C_i \, (\bar{K}_i)^{\lambda_i}$$

where i is the number of flight segments considered in a typical flight.

f. Choose the number of cycles n_i in each segment and then convert the crack-growth-per-segment rate (da/ds) into the crack-growth-per-cycle rate (da/dn), resulting in

$$(da/dn)_i = \left(\frac{1}{n_i}\right)(da/ds) = \left(\frac{1}{n_i} C_i\right) \, (\bar{K}_i)^{\lambda_i}$$

g. Use a cycle-by-cycle crack-growth analysis computer program to calculate the growth behavior.

The cycle-by-cycle crack-growth subroutine built in FLTGRO is identified as ESTCAL. The crack-growth methodology implemented in ESTCAL is similar to that adopted in CRKGRO, the detailed level crack-growth analysis program. A detailed description of the methodology is documented in the User's Manual of CRKGRO [5]. The following paragraphs describe the highlights of the methodology.

2.3. CRACK-GROWTH RATE EQUATION

For cyclic loadings containing positive stress ratios (i.e., $R \geq 0$), the modified Walker equation is used to describe the crack-growth rate per cycle (da/dN). The modified Walker equation can be expressed as:

For $\Delta K > \Delta K_{th}$, $R \geq 0$

$$da/dN = C\left[\Delta K/(1-\bar{R})^{1-m}\right]^{n}, \quad \bar{R} \leq R^{+}_{cut}, \; \bar{R} = R$$

$$\bar{R} > R^{+}_{cut}, \; \bar{R} = R^{+}_{cut}$$

For $\Delta K \leq \Delta K_{th}$, $R \geq 0$

$$da/dN = 0$$

where C and n are the growth rate constants, m is the stress-ratio collapsing factor, and R^{+}_{cut} is the cutoff values of positive stress ratio.

For cyclic loadings containing negative stress ratios (i.e., $R < 0$), the Chang acceleration equation[6] is used. In mathematical form, the Chang equation is expressed as:

$$da/dN = C\left[(1+\bar{R}^{2})^{q}\, K_{max}\right]^{n}, \quad \bar{R} \geq R^{-}_{cut}, \; \bar{R} = R$$

$$\bar{R} < R^{-}_{cut}, \; \bar{R} = R^{-}_{cut}$$

where q is the acceleration index, and R^{-}_{cut} is the cutoff value for the negative stress ratio.

2.4. LOAD INTERACTION MODEL

The Willenborg/Chang load interaction model[7] is adopted in FSTCAL to account for the spectrum loading effects. This model uses the generalized Willenborg model[8] to account for the tensile overload retardation effects, and the Chang acceleration scheme to account for the negative stress effects. The generalized Willenborg model can be written in the following form:

$$(K_{max})_{eff} = K_{\infty_{max}} - \Phi \left[K^{oL}_{max} \left(1 - \frac{\Delta a}{Z_{oL}} \right)^{1/2} - K_{\infty_{max}} \right]$$

$$(K_{min})_{eff} = K_{\infty_{min}} - \Phi \left[K^{oL}_{max} \left(1 - \frac{\Delta a}{Z_{oL}} \right)^{1/2} - K_{\infty_{max}} \right]$$

$$\Phi = \left[1 - \left(K_{max_{th}} \Big/ K_{\infty_{max}} \right) \right] \Big/ (R_{SO} - 1)$$

where $K_{\infty_{max}}$ is the stress-intensity-factor corresponding to the maximum remotely applied stress, K^{oL}_{max} is the stress-intensity-factor corresponding to the maximum stress of the overload, Δa is the incremental growth following the overload, Z_{oL} is the overload interaction zone size, and R_{SO} is the overload shutoff ratio.

For spectrum loadings, the effective stress-intensity-factor range and effective stress ratio are expressed in terms of the maximum and minimum effective stress intensity factors as follows:

$$\Delta K_{eff} = (K_{max})_{eff} - (K_{min})_{eff} = \Delta K_{\infty}$$

$$R_{eff} = (K_{min})_{eff}/(K_{max})_{eff}$$

In the load-interaction-accounted-for option, the program uses the following equation to account for tensile overload retardation effect:

For $\Delta K_{eff} > \Delta K_{th}$, $R_{eff} \geq 0$

$$da/dN = C \left[(\Delta K)_{eff}/(1 - \bar{R}_{eff})^{1-m} \right]^{n}, \quad \bar{R}_{eff} \leq R^{+}_{cut}, \; \bar{R}_{eff} = R_{eff}$$

$$\bar{R}_{eff} > R^{+}_{cut}, \; \bar{R}_{eff} = R^{+}_{cut}$$

For $\Delta K_{eff} \le \Delta K_{th}$

$$da/dN = 0$$

where C, n, m, and R^{+}_{cut} are the same crack-growth rate parameters described under "Fatigue Crack-Growth-Rate Equation." The threshold values of the stress-intensity-factor range are also identical to those used in the constant-amplitude cases.

If the effective stress ratio is negative (i.e., $R_{eff} < 0$), the Chang negative stress ratio equation is used in this program, which accounts for the compressive load acceleration effect:

$$da/dN = C\left[\left(1 + \bar{R}_{eff}^{2}\right)^{q} (K_{max})_{eff}\right]^{n}, \quad \bar{R}_{eff} \ge R^{-}_{cut},\ \bar{R}_{eff} = R_{eff}$$

$$\bar{R}_{eff} < R^{-}_{cut},\ \bar{R}_{eff} = R^{-}_{cut}$$

where q is the acceleration index determined from test data generated for a specific negative stress ratio $R < 0$ and its $R = 0$ counterpart.

Reduction of the overload retardation effect caused by a compressive spike load immediately following the tensile overload is accounted for through an effective overload interaction zone concept proposed by Chang[1]. The effective overload interaction zone is defined in terms of the negative effective stress ratio ($R_{eff} < 0$) as:

$$(Z_{oL})_{eff} = (1 + \bar{R}_{eff})\,(Z_{oL}), \quad \bar{R}_{eff} \ge R^{-}_{cut},\ \bar{R}_{eff} = R_{eff}$$

$$\bar{R}_{eff} < R^{-}_{cut},\ \bar{R}_{eff} = R^{-}_{cut}$$

where Z_{oL} is the plastic zone size introduced by the tensile overload.

The plane strain plastic zone size is used if the stress intensity factor at the maximum depth for a part-through crack is to be calculated. The plane stress plastic zone size is used at the length direction for TC's and PTC's. The plane stress and plane strain plastic zone sizes are:

$$(\sigma_{oL})_{\text{plane strain}} = \frac{1}{6\pi}\left(\frac{K_{\infty_{max}}}{F_{ty}}\right)^2$$

$$(\sigma_{oL})_{\text{plane stress}} = \frac{1}{2\pi}\left(\frac{K_{\infty_{max}}}{F_{ty}}\right)^2$$

where F_{ty} is the material tensile yield strength.

2.5. DAMAGE ACCUMULATION SCHEME

The Vroman linear approximation method has been incorporated into this computer program as the damage accumulation scheme. The following paragraphs briefly describe the method.

For a given load spectrum as schematically shown in Table 1, the Vroman damage accumulation scheme proceeds by considering a load step (i) and using σ_{max_i} and σ_{min_i} to calculate $(da/dN)_i$. The value of $(0.01a)/(da/dN)_i$ is then compared to N_i, where "a" is the instantaneous crack size. If $(0.01a)/(da/dN)_i$ is greater than N_i, then the crack growth for that particular load step is $\Delta a = N_i \times (da/dN)_i$, the crack has then grown from "a" to $(a + \Delta a)$, and the program proceeds to the next load step.

If $(0.01a)/(da/dN)_i$ is less than or equal to N_i, the crack size will be $(a + 0.01a)$, and this load step is reexamined. This process continues with $(0.01a)/(da/dN)_i$ being compared to the remaining cycles in the step. When all load steps in the block or flight have been examined, the program then proceeds to the first step of the next block (or flight) and continues.

TABLE 1. A TYPICAL STRESS SPECTRUM TABLE (SCHEMATIC)

Step	Max Stress	Min Stress	No. of Cyc/ Block (Flight)
1	σ_{max_1}	σ_{min_1}	N_1
2	σ_{max_2}	σ_{min_2}	N_2
3	σ_{max_3}	σ_{min_3}	N_3
⋮	⋮	⋮	⋮
i	σ_{max_i}	σ_{min_i}	N_i

2.6. CRACK GROWTH UPDATING SCHEME

The FLTGRO program uses a random access disk file to store crack-growth data for each control points and each type of mission. Each control point requires the following information: (1) material constants, type of crack, crack geometry, and other parameters necessary to grow a crack, (2) mission type and associated growth rate constants, and (3) a base mission mix. For the crack-growth-per-flight (da/df) approach, the growth-rate parameter stored on the tracking operating file are C, λ, $(\Delta\sigma^2)^{1/2}$, the stress ratio, and the maximum spectrum stress. The multisegment-per-flight method stores growth rate parameter for each flight segment; i.e., c, n, the RMS of the maximum stress in a flight segment, the RMS of σ_{min} in a flight segment, and the number of cycles per segment. The base mission mix is a unitblock of m missions and the number of occurrences per mission.

In any time frame of the Individual Aircraft Tracking (IAT) program, crack growth at a control point can be tracked by executing the FLTGRO program for the missions that have been completed and accessing the data base to obtain the growth rate parameters for each mission. Capability is provided for adding new missions to the data base or to the baseline mission mix. The crack-growth equation coefficients are computed and optionally replaced or appended to the data base. If the missions flown were deviating from the baseline mission mix, the base mix can be updated to reflect the change.

The FATGRO program produces a plot of crack length versus life in flights for the actual nu-ber of missions completed. The baseline mission mix can be optionally plotted on the same graph with the actual crack-growth history or can be displayed individually. The baseline mission is grown to failure to illustrate the life of the control point specimen. Another option is available which appends the base mission crack-growth history the actual growth history. A combination of all these options in figure 2 shows the life of a control point if the base mission was flown, in comparison to the actual life and the predicted life if the base mission is appended.

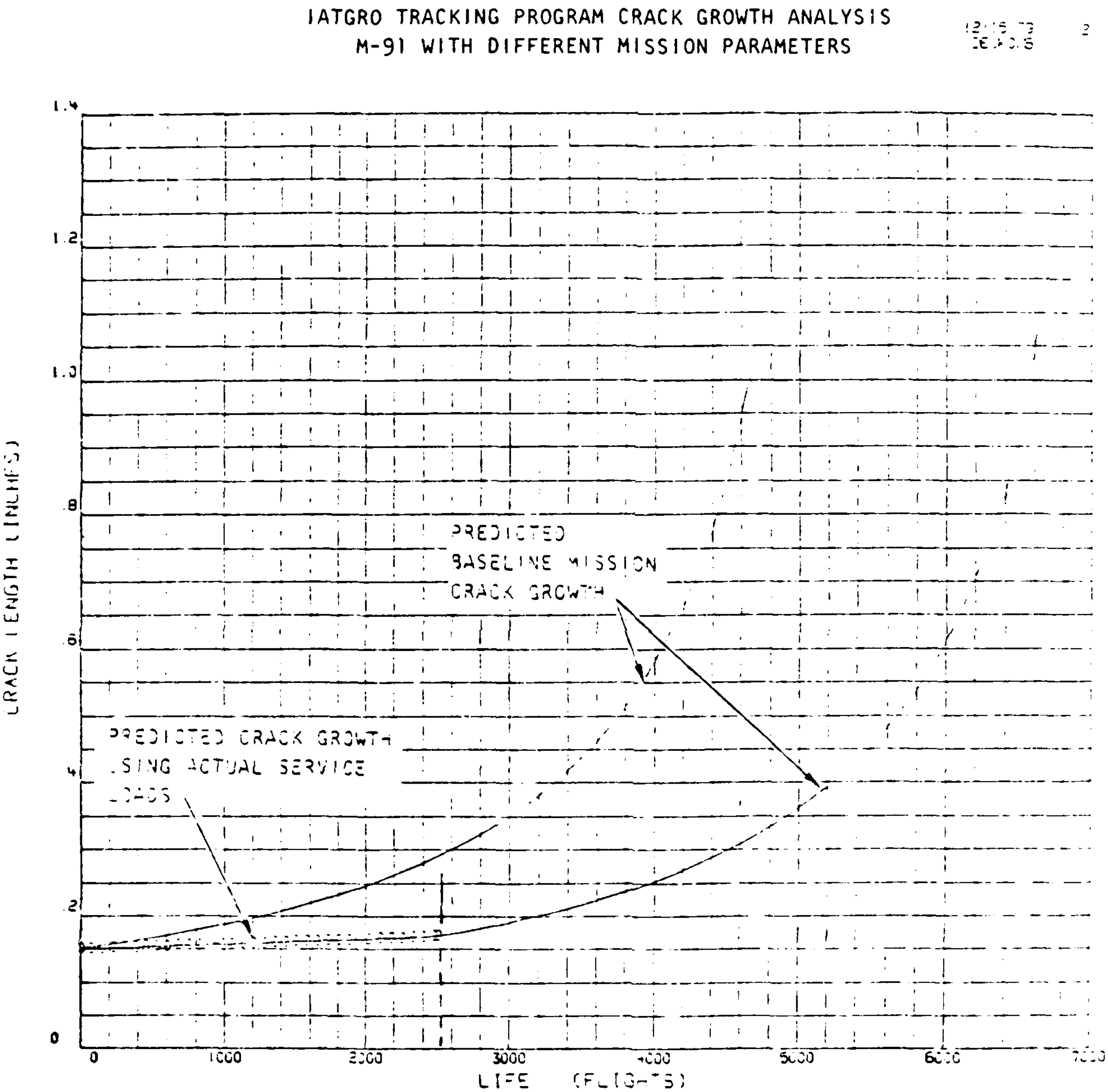


Figure 2. FLTGRO Updating Crack Growth Analysis Results

Section III

PROGRAM OUTLINES

The program identification is FLTGRO. FLTGRO consists of 14 routines. The functions of the main routine and 13 subroutines are:

1.	FLTGRO	Supervisory routine, handles flow, checks keywords, gives diagnostics.
2.	BFBD	Stores keywords for exact code titles and back-face correction tables.
3.	CENTER	Centers title cards for output.
4.	CLAMDA	Computes and prints out C and λ values for the da/dF rate equation in Method I, and C and λ values for the da/dS rate equation in Method II.
5.	CYCCNT	Range-pair-counts the original spectrum loading.
6.	ESTCAL	Reads input, prints output, prepares K-equations, grows the crack using crack-growth rate per cycle (da/dN) equation for a series of initial crack size, a_i, to the final size, a_f. It also prepares tables of C_j, λ_j for mission-mix option.
7.	GROFLT	Prepares K-equations, grows the crack using the crack-growth rate per flight (da/dF) equation from original to critical crack size. Prints out table of crack size versus flights.
8.	LIST	Prints out FLT records stored on the database.
9.	MANAGE	A data base managing routine to read and write FLT records.
10.	NEWLFN	Brings user's file number on input to be recognized.
11.	PARAM	Sets up parameters of analysis results for plotting.
12.	PLOT	Plots grids, labels, and curves for PARAM.
13.	TRP2	Parabolic interpolation routine for back-face correction factor.
14.	WRALLC	Prints out crack-growth data for the series of $C_{initials}$-C_{finals} growths.

Section IV

FLTGRO INPUT DATA DECK

The input data deck for FLTGRO is described in this section. A brief description of each type of input data card is presented in the following. The overall deck setup is shown in Figure 2, and a detailed description of each input card is given on the following pages.

Card 1		FLT database disposition
Card 2a		"Compute C and Lambda" keyword
	2b	Control point identifier
	2c	Problem identification (i.e., title card)
	2d	Material identification and properties
	2e	Root-mean-square power exponent and shutoff ratio
	2f	Stress ratio cutoff and crack-growth rate equation coefficients
	2g	Initial crack sizes and geometry
	2h	Crack coding control
	2i	Number of initial crack sizes for computing C and λ
	2j	Initial crack sizes
	2k	Method-type controls
	2l	Mission identification
	2m	Title identification for a given mission
	2n	Limit stress and control parameters
	2o	Mission loading and printing control parameters
	2p	Stress spectrum
Card 3a		"Grow Crack" keyword
	3b	Control point identifier
	3c	Growing crack control parameters
	3d	Mission sequence definition
Card 4a		"Plot" keyword
	4b	Plotting control parameters
Card 5		"List" keyword
Card 6		"End" keyword

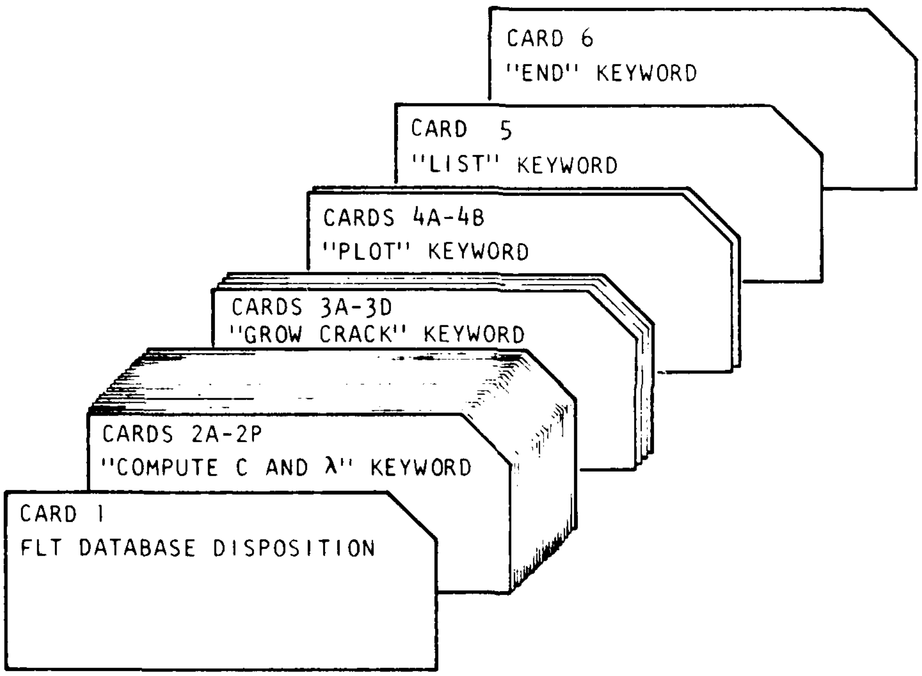


Figure 3. FLTGRO Input Deck Setup

INPUT DATA CARD 1

Description: Database disposition

Format and example:

1	10	20	80
OPTION		DISP	
FLTOF		OLD	

Field	Contents
Option	"FLTOF" keyword, beginning in column 1.
Disp	Disposition of FLT database beginning in column 11. NONE - No FLT operating file will be used. NEW - A new file is to be created. OLD - An existing file is attached.
Remarks	1. This must be the first data card in the data input deck. 2. The Disp field is left-adjusted.

INPUT DATA CARD 2a

Description: Compute keyword card

Format and example:

1 — 20	— 80
OPTION	
COMPUTE C AND LAMBDA	

Field	Contents
Option	"Compute C and Lambda" keyword, beginning in column 1.
Remarks	1. This card initiates the input for the data needed to compute C and λ.
	2. If C and λ were previously computed and stored, an "old" file is attached; then, input cards 2a-2r will be omitted.

INPUT DATA CARD 2b

Description: Control point identifier

Format and example:

1 — 8	18	80
CPIDNT	IREP	
M-85MET1	REPLACE	

Field	Contents
CPIDNT	Any alphanumeric information, maximum of eight characters, the user desires to input for identification of the data calculated by the "Compute C and lambda" option.
IREP	For old control points saved on the FLT file.

BLANK - All required input data; cards 2c-2h will be read from the FLT file.

REPLACE - A new set of input data, read from cards 2c-2h, will be read and stored on the FLT file replacing the old set of data. Left-adjusted, starting in column 9.

For new control points, the input data, cards 2c-2h, will have to be provided in the input stream and IREP shall be left blank.

INPUT DATA CARD 2c

Description: Problem identification title card

Format and example:

Column 1	72	80
PROBID (i)		
SINGLE CYCLE PER FLIGHT, METHOD I, 30 KSI		

Field	Contents
PROBID (i)	Any alphanumeric information which the user desires to input for problem identification.
Remarks	Only the first 72 columns are used for input.

INPUT DATA CARD 2d

Description: Material identification

Format and example:

Column	1	28	36	48	60	72	80
	GEMAID	BISLP	SIGMAY	AKIC	CKC		
	2219-T841 AL.		48.	45.	65.		

Field	Contents
GEMAID	Any alphanumeric information which the user desires to input for material identification (columns 1-36 only).
BISLP	Option to use one- or two-slope rate curve Blank - analysis with one-slope rate curve. "BISLOPE" - analysis with two-slope rate curve.
SIGMAY	Material yield strength (ksi) (F12.0)
AKIC	Plane strain fracture toughness, (ksi $\sqrt{in.}$), used for part-through crack instability criterion on crack depth a. (F12.0)
CKC	Plane stress fracture toughness, (ksi $\sqrt{in.}$), used for through-crack instability criterion on half-crack length c. (F12.0)

Remarks: BISLOPE is a keyword, starting in column 29.

INPUT DATA CARD 2e

Description: Crack growth rate equation coefficients, part 1

Format and example:

Column	1 — 10	20	80
	POWER	RETDA	
	2.	3.	

Field	Contents
POWER	Power exponent b to calculate the average of the b-th power product, $(\overline{\Delta\sigma^b})^{1/b}$, where $\Delta\sigma$ is the stress range. (F10.0)
RETDA	Retardation shutoff ratio. (F10.0)

INPUT DATA CARD 2f

Description: Stress ratio cutoff values and crack-growth rate equation parameters

Format and example:

Column	1	6	12	18	24	36	42
	RCUT	RCUTN	EXPM	EXPQ	CWALK	EXPN	THA
	.75	-0.50	.6	1.0	5.066-10	3.83	1.0

48	60	80
	DELKTH	
	2.5	

Field	Contents
RCUT	The cutoff value of the positive stress ratio "-R" below which it it is assumed the material does not show stress ratio layering in (da/dN) vs ΔK plots. (F6.0)
RCUTN	The cutoff value of the negative stress ratio "-R" below which it is assumed the material does not show further accelerated growth rate. (F6.0)
EXPM	Walker stress ratio effect exponent. (F6.0)
EXPQ	Chang growth-rate equation (for $R < 0$) exponent. (F6.0)
CWALK	Walker growth-rate equation (for $R \geq 0$) coefficient. (E12.0)
EXPN	Walker growth-rate equation (for $R \geq 0$) exponent. (F6.0)
THA	Threshold constant (F6.0) 1. - Variable threshold 0. - Fixed threshold
DELKTH	The threshold value of ΔK (ksi $\sqrt{\text{in.}}$) obtained from $R = 0$ test. (F12.0)

INPUT DATA CARD 2f (Concluded)

Remarks: If "BISLOPE" option was used on card 2d, then an extra input card follows for the lower region of the rate curve:

Extra input card for "BISLOPE" analysis

6	12	18	24	36	42	48	60	72	
		EXPML	EXPQL	CWALKL	EXPNL		TRANSL	ATLEV	
		.6	1.0	4.33 -15	12.9		5.7	1.0 -07	

EXPML
EXPQL
CWALKL
EXPNL

As defined before, but for the lower part i.e.: Region I of the da/dn vs ΔK rate curve.

TRANSL The ΔK value of the transition from upper to lower curve, i.e.: from Region II to Region I. (F12.0)

ATLEV The level of da/dn for the transition from Region II to Region I. (E12.0)

INPUT DATA CARD 2g

Description: Initial crack sizes and geometry

Format and example:

Column	1	12	24	36	48	60	72 — 80
	AINIT	ASPR	RADIUS	CINIT	THK	WIDTH	
				.05	.25	6.0	

Field	Contents
AINIT	Initial value of crack depth a (inches) for part-through crack. (F12.0)
ASPR	Aspect ratio, (a/2c), for part-through crack. (F12.0)
RADIUS	Radius of hole (inch), if no hole leave blank. (F12.0)
CINIT	Initial value of crack length, c (inches); half of surface length dimension for centered cracks, full length for edge cracks. (F12.0)
THK	Equivalent thickness for transition; usually, it is the thickness of the plate. (F12.0)
WIDTH	Width of the plate, (inches). For centered cracks, the program halves the value of the width of the plate. (F12.0)

INPUT DATA CARD 2i

Description: Number of initial crack sizes for computing C and λ

Format and example:

Column	1 5	80
	NCASE	
	12	

Field	Contents
NCASE	Number of initial crack sizes to be read from card 2j. Ncase is required for Methods I and II and is right-adjusted. (I5)

INPUT DATA CARD 2h

Description: Crack code controls

Format and example:

Column 1 6 12 80

CODE	NRETRD	
2010	1	

Field	Contents
CODE	Crack code no. (See crack library, p.) Starting in column 1
NRETRD	Retardation option: (I6) 0 = without load interaction 1 = with load interaction
Remarks	Crack code no. left adjusted NRETRD, right adjusted

INPUT DATA CARD 2j

Description: Initial crack sizes

Format and example:

Column 1 5 10 15 20 25 30 35 40

Ci	Ci+1	Ci+2	Ci+3	Ci+4	Ci+5	Ci+6	Ci+7
.01	.03	.05	.1	.2	.5	.8	1.0

40 45 50 55 60 65 70 75

Ci+8	Ci+9	Ci+10	Ci+11	Ci+12	Ci+13	Ci+14
1.5	2.0	2.5	2.95			

75 80

Field Contents

The initial crack lengths, NCASE lengths are read in. For part-through-cracks Ci's are the initial crack depths. For through-cracks Ci's are half of the initial surface lengths for centered cracks; full lengths for edge cracks. (Refer to input cards 2g and 2h.) (F5.0)

INPUT DATA CARD 2m

Description: Method-type controls

Format and example:

Column	1 5	10	15	80
	NPROB	METHOD	NSEG	
	3	1		

Field	Contents
NPROB	The number of different cases for which parameter c and n needed be estimated (I5).
METHOD	1 - Determine C and λ for each mission (cycle/flight). 2 - Determine C and λ for each mission segment. (I5)
NSEG	Number of segments in a flight to compute C and λ for Method II only. (I5)
Remarks	All input fields for this card are right-adjusted.

1. Default is Method I.

2. If NPROB > 1, then NPROB sets of cards 2n-2q will follow when spectra are stored on files, or NPROB sets of cards 2n-2r follow if spectra are on cards.

3. A total of 50 sets of C and λ can be determined.

INPUT DATA CARD 2n

Description: Mission segment identification for loading condition

Format and example:

Column

1	8	12	20	24
MISID(i)	ISEG(i)	MISID (i+1)	ISEG (i+1)	
A-A30 KSI				

24	32	36	44	48
MISID (i+2)	ISEG (i+2)	...	...	

48	56	60	68	72	80
...	...	MISID (NSEG)	ISEG (NSEG)		

Field | Contents

For Method I:

MISID (i) Mission identifier (maximum of eight characters); rest of card is blank). (A8)

For Method II:

MISID (i) Mission segment identification (maximum of eight characters).

ISEG (i) Terminating cycle number in flight for mission segment, right-adjusted. (I4)

ISEG (NSEG) is equal to the total number of cycles in flight.

NSEG is given on card 2m.

INPUT DATA CARD 2o

Description: Title identification

Format and example:

Column 1	68	80
NAME	
RANDOM A-A SIGMA=30 KSI	

Field	Contents
NAME	Title identification (up to 68 characters) for mission defined by cards 2m and 2n.

INPUT DATA CARD 2p

Description: Limit stress and control parameters

Format and example:

Column 1 12 17 29 80

SIGLIM	MOSGMA	SMULTI	
50.0	1	1.0	

Field	Contents
SIGLIM	Limit stress (ksi). (F12.0)
MOSGMA	Stress input control parameter (I5) ≥ 0 - stress is in terms of percent of limit stress. < 0 - stress is in terms of ksi.
SMULTI	Stress magnification or reduction factor to bring spectrum to desired stress level. (F12.0)
Remarks	Mosgma is right-adjusted.

If MOSGMA ≥ 0 $\quad \text{Stress} = \dfrac{\text{Siglim x Smulti}}{100}$

MOSGMA < 0 $\quad \text{Stress} = \text{Stress x Smulti}$

INPUT DATA CARD 2q

Description: *Mission loading and printing control parameters*

Format and example:

Column

Column	1–5	6–10	11–15	16–20	21–25	26–30	31–35
	NFLIGHT	L	NUNIT		MOPEAK	MOCRK	KCON
	1	950	50		1	1	1

Column	36–40	41–45	46–80
	NFILE	NRP	
	12	0	

Field	Contents
NFLIGHT	Number of unit blocks applied for crack growth computation to estimate C, λ and product.
L	Number of cycles in a unit-block, or given subunit-block.
NUNIT	Number of flights in a unit-block or given subunit-block.
MOPEAK	Input peaks-valleys adjustment parameter: ≥ 0 - MIN-MAX input < 0 - MAX-MIN input
MOCRK	Print control parameter for crack growth data: ≥ 0 - Crack-growth data are printed. < 0 - Crack-growth data are not printed.
KCON	Print control parameter for stress history: > 0 - Input stress history is not printed. ≤ 0 - Input stress history is printed.
NFILE	Alternate file where stress spectrum is stored. This file input unit number must be between 10 and 98, inclusive. If NFILE is negative, this unit is rewound before reading of file. If 0 or 5, card input is expected.
NRP	Control for range-pair counting: 0 = No range-pair counting. 1 = Range-pair counting.
Remarks	All input fields for this card are right-adjusted.

INPUT DATA CARD 2r

Description: Stress spectrum

Format and example:

Column

1	5	15	25	35
DATA	SMAXi	SMINi	CYCLEi	
	15.81	5.6	1.0	

or

1	5	15	25	35
DATA	SMINi	SMAXi	CYCLEi	
	-5.0	15.81	1.0	

Field	Contents
DATA	Blank on all SMAXi, SMINi, CYCLEi cards. "End" on extra card marking the end of a spectrum, starting in column 1.
SMIN	Minimum stress value (ksi).
SMAX	Maximum stress value (ksi).
Remarks	1. The spectrum is read on the unit defined by NFILE on card 2q. 2. The min-max or max-min input is defined by MOPEAK on card 2q. 3. For mission mix option, spectrum is limited to 3000 or less steps (i) in each uniblock.

INPUT DATA CARD 3a

Description: "Grow Crack" keyword card

Format and example:

Column 1 10 80

1–10	11–80
OPTION	
GROW CRACK	

Field	Contents
OPTION	"GROW CRACK" keyword, beginning in column 1.

INPUT DATA CARD 3b

Description: Control point identifier

Format and example:

Column	1 8	80
	CPIDNT	
	M-85	

Field	Contents
CPIDNT	The alphanumerical information (maximum of eight characters) used for identification of the data that were stored is now attached and is to be read from the FLT data base. This card is required only when the "compute C and lambda" option is not used.

INPUT DATA CARD 3c

Description: Growing crack control parameters

Format and example:

Column 1 8 16 24 32 40 48 56

CF	NBLKS	NMIX	NBASE	NREPET	NBASEI	NRETRD
0.	10000	3	0	0	0	

56 64 80

FNIBLK	

Field	Contents
CF	Final crack length (inches).
NBLKS	Number of blocks (limiting number of flights for the C vs flight growth curve).
NMIX	Number of mission strings.
NBASE	= 1 - If final or critical crack size is not reached upon completion of the discrete missions mix, append the base mission mix. = 0 - Only discrete mission mix is used.
NREPET	= 1 - Grow the crack using the base mission mix. = 0 - No operation.
NBASEI	= 1 - Input mission mix is to be stored as the base mission mix. = 0 - No operation.
NRETRD	= 1 - Load interaction is considered (for Method II only). = 0 - Load interaction is not considered.
FNIBLK	Total number of flights in one mission (for Method II only).
Remarks	All input fields for this card are right-adjusted, except for CF.

INPUT DATA CARD 3d

Description: Mission sequence definition

Format and example:

Column 1 8 12 20 24 32

NFAC(i)	MIS(i)	NFAC(i+1)	MIS(i+1)	NFAC(i+2)	
1	1	4	2	1	

32 36 44 48 56

	MIS(i+2)	NFAC(i+3)	MIS(i+3)	NFAC(i+4)	
	1				

56 60 68 72 80

	MIS(i+4)	NFAC(i+5)	MIS(i+5)	

Field	Contents
NFAC	The number of times the loading condition is to be repeated.
MIS	The sequence number for the loading condition as saved in the FLT database. The sequence number can be obtained from the printout of the "LIST" option.

Remarks

1. All input fields for this card are right-adjusted.
2. Card 3d is needed for Methods I and II.
3. Mission mix applies to Method I only.

INPUT DATA CARD 4a

Description: Plot keyword card

Format and example:

Column	1 80
	OPTION
	PLOT

Field	Contents
OPTION	"PLOT" keyword, beginning in column 1.

INPUT DATA CARD 4b

Description: Plotting control parameters

Format and example:

Column 1 5 10 15 20 25

OPT		SCALE(1,1)	SCALE(2,1)	
1		0	0	

25 30 80

Field	Contents
OPT	Specifying parameters to be plotted. 1 - Plot 0 - No plot OPT = Crack size versus life in flights.
SCALE(2,1)	Array specifying linear, semilog, or log-log grid scaling. SCALE (1,) = 0 - x-axis is linear 1 - x-axis is log SCALE (2,) = 0 - y-axis is linear 1 - y-axis is log
Remarks	All values are integers, right-adjusted.

INPUT DATA CARD 5

Description: LIST keyword card

Format and example:

Column	1 ... 80
	OPTION
	LIST

Field	Contents
OPTION	"LIST" keyword, beginning in column 1.
Remarks	This option will list the loading conditions that have been saved on the FLT database.

INPUT DATA CARD 6

Description: END keyword card

Format and example:

Column	1 ... 80
	OPTION
	END

Field	Contents
OPTION	"END" keyword, beginning in column 1.
Remarks	This card terminates the input data deck and signals the program to terminate execution.

Section V

EXAMPLE CASES

This section presents two example cases which are designed to illustrate the capability of the FLTGRO program. The first example is to predict the crack-growth behavior of a 2219-T851 aluminum center-craked-tension (CCT) specimen subjected to a typical figher spectrum loading. Figure 4 shows the specimen dimensions and the crack configuration by the single-cycle-per-flight method (Method I).

The crack-growth rate constants and parameters used in the example are as follows:

$C = 5.066 \times 10^{-10}$ $\quad R_{so} = 3$

$n = 3.83$ $\quad q = 1.0$

$m = 0.6$ $\quad R^{+}_{cut} = +0.75$

$\Delta K_{th} = 1.5$ ksi in. $\quad R^{-}_{cut} = -0.99$

$K_c = 65$ ksi in. $\quad \sigma_{ty} = 48$ ksi

$b = 2$

The spectrum used in this example was a typical fighter aircraft air-to-ground (A-G) mission, generated in phase III of this research and development effort (4). The detailed spectrum table is shown in the appendix. The spectrum is in the random cycle-by-cycle format which contains 150 flights, each flight consisting of 19 cycles. Each peak and valley is in the percentage of design limit stress (% of DLS). The random spectrum was range-pair counted before it was used in the analysis. The range-pair counted spectrum was printed out as shown in the example. All the peaks and valleys were converted to stress in KSI unit, based on $\sigma_{lim} = 24$ ksi.

Eight (8) initial crack sizes were selected in order to characterize the A-G mission. These 8 initial crack sizes were:

C_i = 0.1, 0.2, 0.3, 0.4, 0.5, 0.7, 0.9, and 1.1 (all in inches).

The input echoes are shown in the following computer print-out. A table of dc/dF vs $\overline{K}$ for these 8 points was also prepared by the FLTGRO program shown in the output printout. The characterized A-G mission crack-growth-rate-per-flight parameters obtained by FLTGRO are:

$$C = 2.0648 \times 10^{-6}$$

$$\lambda = 3.6119$$

$$\bar{\sigma} = 10.692 \text{ ksi}$$

These characterized crack-growth-rate-per-flight parameters were then used to perform crack-growth prediction on a case. The initial crack size was C_i = 0.145 inch. All crack growth parameters used in the life prediction are listed in the printout. The crack-growth summary table is shown in the last page of the computer printed outputs of this example. The table shows the FLTGRO predicted life from C_i = 0.145 in. to failure was Np = 5462 flights.

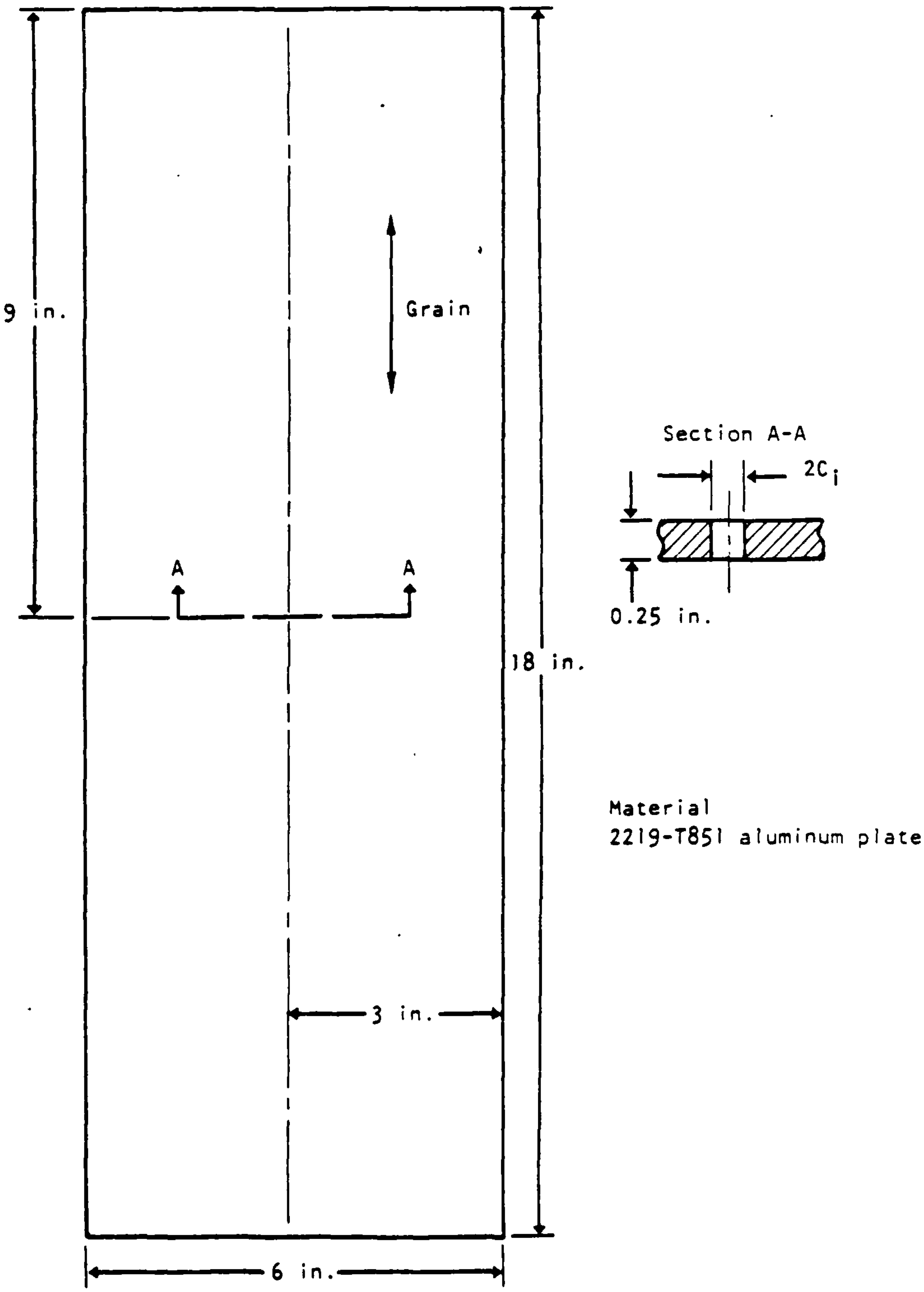


Figure 4. Test Specimen Configuration

```
FLTJF      NONE
COMPUTE C AND LAMBDA
A-G BASE
F-B-2   AIR-TO GROUND SPECTRUM,   FOR CENTERED THRU CRACK
2219-T851 ALUMINUM                            48.         45.        60.
 2.           3.
 .75  -0.99  0.6   1.0   5.166   -10 3.65  0.    1.5
                                     0.145       .25        6.0
2013        1
      8
0.10 0.20 0.30 0.40 0.50 0.70 0.9  1.10
     1      1
A-G
F-B-2   AIR-TO-GROUND SPECTRUM
 24.                 1  1.25
     1 2851  150           -1    -1    -1    15    1
GRO. CRACK
   3.         10000        1      0      0      0        1
         1    1
PLOT
     0            0    0
END
```

```
FLIGHT BY FLIGHT CRACK GROWTH ANALYSIS      F L T C R C

F-B-2   AIR-TO GROUND SPECTRUM,   FOR CENTERED THRU CRACK
2219-T851 ALUMINUM

CRACK GROWTH RATE EQUATION FOR CALCULATING C, LAMBDA, AND SIGMA
     DA/N = CWALK * (DELTA K/(1-R)**(1-M))**N

ANALYSIS FOR THIS RUN IS DONE BY THE SINGLE CYCLE PER FLIGHT METHOD
INPUT MATERIAL CONSTANTS AND CONTROL PARAMETERS

YIELD STRESS -----  SIGMAY=    45.00 (KSI)
KIC FOR A    -----  AKIC  =    45.00 (KSI*SQRT(INCH))
KIC FOR C    -----  CKIC  =    65.00 (KSI*SQRT(INCH))

POWER               -----      =   .20000E+01
WALKER"S COEFF      -----    C =   .51660E-09
EXP SMALL N       -------    N =   .35330E+01
EXP SMALL M       -------    M =   .60000E+00
EXP SMALL Q       -------    Q =    1.000
+R CUTOFF        -----  RCUT+ =     .750
-R CUTOFF        -----  RCUT- =    -.990

THRESHOLD=   1.5* (1.-0.3*ABS(R))
INIT. HALF CRACK SIZE   C0 = SPECIFIED LATER.
INITIAL CRACK DEPTH     A0 =  .              (INCH)
ASPECT RATIO  ----  A0/2C0 =  .
PHI SQUARED   ----------   =  .
EQUIVALENT THICKNESS - T   =  .25000E+00 (INCH)
HALF WIDTH    ------  W/2  =  .30000E+01 (INCH)

TYPE      = 2     (PART THROUGH CRACK=1.  THROUGH CRACK=2)
CRACK CODE= 2010      THROUGH CRACK, CENTERED
RETARD    = 1     (NO LOAD INTERACTION= , WITH LOAD INTERACTION=1)
RETARDATION SHUT-OFF RATIO FOR CRACK ARREST=  3.0
```

****

F-B-2 AIR-TO-GROUND SPECTRUM

****

DESIGN LIMIT STRESS= .2400E+02 (KSI)
SPECTRUM HAS BEEN RANGE PAIRED

STRESS HISTORY AS PRESCRIBED
IN PERCENTAGE OF SIGLIM= 24.00 (KSI)

41.90	29.60	1.00	21.10	7.50	1.00	48.90	6.30	1.00
37.10	8.40	1.00	37.60	16.40	1.00	28.60	17.80	1.00
49.50	4.20	1.00	26.40	13.60	1.00	42.90	11.40	1.00
74.10	4.00	1.00	34.50	20.30	1.00	21.00	7.80	1.00
39.50	2.10	1.00	23.80	11.30	1.00	71.50	1.50	1.00
43.60	11.30	1.00	33.10	10.90	1.00	56.30	8.50	1.00
51.40	.60	1.00	18.80	[illegible]	1.00	55.90	2.60	1.00
48.60	31.70	1.00	17.30	6.90	1.00	44.10	25.30	1.00
42.40	30.60	1.00	44.30	[illegible]	1.00	31.20	4.90	1.00
28.60	8.60	1.00	29.70	14.40	1.00	28.40	18.00	1.00
44.20	8.00	1.00	35.20	16.40	1.00	51.80	2.90	1.00
23.30	8.10	1.00	21.70	8.70	1.00	59.50	-10.00	1.00
47.30	12.30	1.00	67.10	[illegible]	1.00	57.20	42.20	1.00
35.40	14.50	1.00	27.60	[illegible]	1.00	19.60	5.50	1.00
27.70	8.90	1.00	31.10	3.70	1.00	28.80	9.20	1.00
22.60	12.50	1.00	41.00	.60	1.00	26.40	10.30	1.00
39.30	.50	1.00	13.00	5.10	1.00	29.70	5.70	1.00
31.40	0.00	1.00	22.30	10.70	1.00	24.50	4.30	1.00
12.00	1.60	1.00	48.20	-.10	1.00	31.10	6.60	1.00
23.70	7.10	1.00	35.20	12.10	1.00	49.20	11.00	1.00
78.40	-10.00	1.00	29.20	[illegible]	1.00	29.50	6.70	1.00
31.60	11.90	1.00	26.30	16.10	1.00	37.80	4.40	1.00
17.20	5.80	1.00	[illegible]	3.20	1.00	42.50	6.50	1.00
40.30	22.00	1.00	33.00	8.50	1.00	49.90	-1.20	1.00
43.20	22.50	1.00	45.20	[illegible]	1.00	33.60	13.10	1.00
25.10	8.40	1.00	[illegible]	[illegible]	1.00	42.40	11.30	1.00
34.60	10.60	1.00	71.70	[illegible]	1.00	35.10	5.10	1.00
32.10	11.20	1.00	40.30	5.40	1.00	37.30	15.40	1.00
46.90	1.40	1.00	24.10	8.50	1.00	40.80	21.20	1.00
42.70	3.80	1.00	23.30	9.40	1.00	28.40	5.10	1.00
48.10	.10	1.00	[illegible]	26.20	1.00	40.00	4.40	1.00
[illegible]	3.60	1.00	[illegible]	[illegible]	1.00	35.60	0.00	1.00
31.10	5.20	1.00	[illegible]	[illegible]	1.00	53.10	-10.00	1.00
36.80	11.10	1.00	35.70	11.70	1.00	40.10	9.00	1.00
29.40	[illegible]	1.00	[illegible]	7.20	1.00	25.40	14.30	1.00

34.90	6.50	1.00	30.10	17.[illegible]	1.00	38.50	-5.60	1.00
32.30	14.50	1.00	33.10	6.90	1.00	35.20	3.60	1.00
37.70	0.00	1.00	37.00	12.10	1.00	50.50	3.00	1.00
23.90	8.50	1.00	37.70	5.70	1.00	30.60	18.30	1.00
62.80	-10.00	1.00	36.70	10.50	1.00	39.30	3.60	1.00
38.00	4.00	1.00	32.30	7.20	1.00	35.10	19.60	1.00
55.20	1.90	1.00	47.40	[illegible]	1.00	38.10	3.00	1.00
32.00	14.60	1.00	21.20	7.50	1.00	29.60	12.20	1.00
37.90	2.70	1.00	33.60	15.70	1.00	45.30	.30	1.00
32.50	8.60	1.00	46.50	-.40	1.00	75.60	-10.00	1.00
33.50	10.80	1.00	27.10	14.80	1.00	48.80	2.80	1.00
35.10	17.90	1.00	57.[illegible]	2.20	1.00	38.90	13.80	1.00
48.30	26.30	1.00	64.10	-.70	1.00	34.40	12.60	1.00
53.90	17.30	1.00	62.10	-10.00	1.00	39.10	27.30	1.00
38.50	8.70	1.00	45.30	23.40	1.00	47.80	6.60	1.00
33.80	10.30	1.00	70.[illegible]	-10.00	1.00	35.30	1.70	1.00
50.30	.80	1.00	41.40	3.10	1.00	25.60	13.90	1.00
30.70	15.90	1.00	53.50	.20	1.00	38.90	1.30	1.00
28.10	2.20	1.00	25.[illegible]	10.[illegible]	1.00	58.80	-.50	1.00
36.80	3.30	1.00	31.20	4.50	1.00	48.70	1.60	1.00
26.90	2.50	1.00	19.90	2.50	1.00	58.50	.30	1.00
27.60	17.30	1.00	33.[illegible]	4.50	1.00	32.80	3.00	1.00
35.70	7.50	1.00	41.[illegible]	-.40	1.00	39.70	27.80	1.00
19.50	6.20	1.00	32.10	6.20	1.00	31.70	11.40	1.00
18.60	2.50	1.00	60.70	13.50	1.00	64.90	-10.00	1.00
29.60	16.90	1.00	41.60	5.[illegible]	1.00	36.20	3.90	1.00
28.90	9.20	1.00	34.10	7.40	1.00	32.30	14.80	1.00
37.90	1.30	1.00	25.10	13.50	1.00	25.70	6.80	1.00
46.10	2.50	1.00	38.[illegible]	22.50	1.00	33.[illegible]	3.20	1.00
25.30	15.30	1.00	37.80	13.90	1.00	69.40	-10.00	1.00
34.40	10.30	1.00	30.20	17.50	1.00	36.30	16.10	1.00
45.60	5.30	1.00	36.[illegible]	11.[illegible]	1.00	35.70	11.80	1.00
24.50	12.[illegible]	1.00	21.[illegible]	7.[illegible]	1.00	54.[illegible]	5.20	1.00
42.40	11.60	1.00	59.30	1.50	1.00	47.90	24.60	1.00
25.60	6.20	1.00	38.60	3.70	1.00	20.90	6.30	1.00
47.20	18.90	1.00	63.40	.[illegible]	1.00	15.50	1.10	1.00
48.60	3.60	1.00	53.30	-1[illegible]	1.00	46.10	3.70	1.00
43.40	16.90	1.00	23.20	12.60	1.00	45.90	5.80	1.00
49.50	1.00	1.00	35.50	13.70	1.00	44.50	10.80	1.00
34.20	3.40	1.00	16.60	5.10	1.00	53.60	.70	1.00
45.80	3.60	1.00	34.[illegible]	4.[illegible]	1.00	60.20	-10.00	1.00
19.70	8.60	1.00	33.40	6.20	1.00	44.90	2.90	1.00
40.10	19.50	1.00	37.00	.[illegible]	1.00	40.[illegible]	22.30	1.00
56.40	-1.20	1.00	46.60	23.30	1.00	54.[illegible]	1.70	1.00
28.20	11.70	1.00	33.30	3.[illegible]	1.00	12.30	.80	1.00
33.70	.40	1.00	3[illegible]	2.40	1.00	27.00	5.00	1.00
39.[illegible]	12.20	1.00	45.20	-1.70	1.00	29.50	10.10	1.00
34.90	9.[illegible]	1.00	31.70	16.50	1.00	18.30	6.50	1.00
19.60	[illegible]	1.00	53.70	-1[illegible]	1.00	25.[illegible]	10.80	1.00
28.70	2.20	1.00	32.10	.[illegible]	1.00	49.50	.10	1.00
29.50	5.20	1.00	21.[illegible]	5.[illegible]	1.00	21.50	5.40	1.00
46.00	-4.50	1.00	23.30	9.70	1.00	41.00	19.30	1.00

44.90	4.60	1.00	[illegible]	[illegible]	1.00	24.70	12.30	1.00
38.70	5.90	1.00	[illegible]	[illegible]	1.00	35.70	1.20	1.00
27.90	8.60	1.00	50.40	-.90	1.00	31.80	21.50	1.00
46.90	7.70	1.00	45.10	14.30	1.00	32.20	3.40	1.00
37.90	.30	1.00	24.30	[illegible]	1.00	43.80	.90	1.00
37.50	10.20	1.00	36.10	7.40	1.00	67.20	.50	1.00
51.40	13.90	1.00	25.90	15.20	1.00	54.60	4.00	1.00
54.20	7.70	1.00	[illegible]	[illegible]	1.00	68.40	2.50	1.00
35.40	13.60	1.00	42.30	6.10	1.00	27.00	15.10	1.00
30.10	11.90	1.00	[illegible]	7.60	1.00	58.40	7.30	1.00
24.50	11.90	1.00	39.00	8.40	1.00	54.60	25.40	1.00
74.10	-10.00	1.00	60.30	2.50	1.00	44.70	21.80	1.00
43.60	7.60	1.00	36.10	20.40	1.00	60.50	-.50	1.00
34.30	19.30	1.00	41.30	[illegible]	1.00	37.70	27.00	1.00
24.50	[illegible]	1.00	31.00	.20	1.00	57.50	[illegible]	1.00
41.50	9.40	1.00	45.40	7.90	1.00	[illegible]	5.10	1.00
37.80	27.00	1.00	40.10	[illegible]	1.00	21.90	6.40	1.00
28.40	11.20	1.00	34.70	9.70	1.00	42.20	8.20	1.00
[illegible]	17.50	1.00	43.70	.40	1.00	41.10	19.10	1.00
49.30	.30	1.00	24.50	12.30	1.00	42.90	11.90	1.00
23.80	.70	1.00	[illegible]	13.30	1.00	62.50	-10.00	1.00
40.20	3.20	1.00	34.10	[illegible]	1.00	52.30	2.20	1.00
24.40	11.90	1.00	43.60	[illegible]	1.00	34.70	23.20	1.00
38.90	-.10	1.00	25.30	[illegible]	1.00	[illegible]	10.10	1.00
21.20	7.40	1.00	[illegible]	.90	1.00	19.90	1.40	1.00
36.40	0.00	1.00	32.50	[illegible]	1.00	[illegible]	2.00	1.00
33.50	7.10	1.00	[illegible]	-3.60	1.00	28.40	13.10	1.00
36.30	10.80	1.00	55.10	1.40	1.00	49.60	34.60	1.00
28.30	7.30	1.00	35.70	8.30	1.00	50.60	13.30	1.00
57.10	8.30	1.00	[illegible]	9.50	1.00	36.60	14.20	1.00
39.50	21.60	1.00	41.50	14.20	1.00	48.90	16.50	1.00
41.60	19.70	1.00	47.70	11.30	1.00	59.60	-11.60	1.00
51.40	6.10	1.00	[illegible]	[illegible]	1.00	57.10	3.70	1.00
[illegible]	11.70	1.00	[illegible]	-.10	1.00	23.20	8.30	1.00
24.90	.70	1.00	43.30	.10	1.00	24.50	8.40	1.00
[illegible]	12.40	1.00	[illegible]	[illegible]	1.00	[illegible]	14.40	1.00
42.40	.50	1.00	[illegible]	3.60	1.00	49.60	.20	1.00
29.40	2.20	1.00	[illegible]	3.70	1.00	46.60	.80	1.00
59.40	[illegible]	1.00	[illegible]	9.10	1.00	25.80	10.50	1.00
[illegible]	5.40	1.00	[illegible]	8.30	1.00	44.40	[illegible]	1.00
34.10	[illegible]	1.00	38.00	15.60	1.00	[illegible]	[illegible]	1.00
25.10	-.70	1.00	[illegible]	[illegible]	1.00	62.10	3.50	1.00
27.90	15.40	1.00	[illegible]	[illegible]	1.00	40.80	20.90	1.00
[illegible]	12.20	1.00	28.50	[illegible]	1.00	23.80	12.70	1.00
35.60	11.20	1.00	[illegible]	[illegible]	1.00	46.90	5.30	1.00
29.20	7.90	1.00	35.10	5.40	1.00	26.70	5.00	1.00
49.30	-2.30	1.00	[illegible]	[illegible]	1.00	[illegible]	5.00	1.00
43.30	1.60	1.00	45.70	[illegible]	1.00	47.80	.50	1.00
26.20	[illegible]	1.00	[illegible]	-.40	1.00	31.10	10.40	1.00
38.60	5.60	1.00	[illegible]	[illegible]	1.00	[illegible]	-1.70	1.00
[illegible]	.20	1.00	[illegible]	16.40	1.00	72.00	[illegible]	1.00
[illegible]	16.40	1.00	[illegible]	[illegible]	1.00	45.60	9.10	1.00

47.30	8.40	1.00	3[illegible].40	12.50	1.00	47.70	-.10	1.00
27.20	6.[illegible]0	1.00	17.70	4.30	1.00	19.60	4.20	1.00
22.50	4.20	1.00	51.[illegible]0	-10.00	1.00	19.10	5.30	1.00
23.00	6.40	1.00	24.10	13.30	1.00	50.70	-1.00	1.00
46.00	18.30	1.00	33.30	11.50	1.00	37.60	7.40	1.00
53.70	-1.50	1.00	34.10	21.30	1.00	36.10	2.90	1.00
35.70	13.50	1.00	23.00	4.90	1.00	25.20	14.20	1.00
25.30	10.20	1.00	45.10	2[illegible]	1.00	58.[illegible]0	-.90	1.00
37.90	15.30	1.00	53.20	[illegible]	1.00	33.20	12.50	1.00
38.30	.50	1.00	35.10	4.30	1.00	62.40	-10.00	1.00
26.00	11.30	1.00	47.70	[illegible]	1.00	41.60	29.80	1.00
53.30	-.80	1.00	22.00	.60	1.00	31.90	14.70	1.00
44.90	-1.80	1.00	37.40	.70	1.00	24.80	2.30	1.00
29.90	5.10	1.00	46.00	-1.50	1.00	14.50	.30	1.00
16.90	2.00	1.00	45.00	20.[illegible]0	1.00	50.80	-.50	1.00
17.80	5.40	1.00	39.60	22.90	1.00	67.90	.40	1.00
25.20	9.60	1.00	36.[illegible]0	8.[illegible]0	1.00	27.60	9.50	1.00
47.30	6.90	1.00	27.70	11.30	1.00	28.90	18.50	1.00
39.50	8.60	1.00	75.10	-10.00	1.00	21.20	7.40	1.00
69.00	-10.00	1.00	35.[illegible]0	14.40	1.00	52.90	6.10	1.00
26.20	4.10	1.00	28.[illegible]0	14.20	1.00	53.40	.60	1.00
35.60	10.10	1.00	38.10	4.30	1.00	56.00	1.50	1.00
45.60	23.90	1.00	37.10	7.10	1.00	31.20	8.30	1.00
22.90	7.90	1.00	32.10	12.30	1.00	65.90	-.90	1.00
24.40	12.50	1.00	31.80	14.10	1.00	27.70	14.90	1.00
41.10	4.40	1.00	51.60	32.40	1.00	55.20	-10.00	1.00
47.90	7.60	1.00	54.30	1.50	1.00	40.80	11.00	1.00
36.50	20.50	1.00	35.70	7.70	1.00	25.60	14.70	1.00
24.30	9.10	1.00	33.30	11.20	1.00	48.60	5.50	1.00
37.10	18.10	1.00	49.00	4.60	1.00	35.90	11.90	1.00
21.10	8.10	1.00	31.80	2.40	1.00	17.90	6.50	1.00
18.40	6.00	1.00	33.40	.20	1.00	52.30	.10	1.00
35.30	.70	1.00	24.00	7.50	1.00	37.10	5.10	1.00
56.40	8.60	1.00	33.70	21.[illegible]0	1.00	39.30	29.10	1.00
40.10	19.50	1.00	63.30	9.20	1.00	68.[illegible]0	-10.00	1.00
37.90	23.70	1.00	38.40	15.10	1.00	21.30	6.70	1.00
54.90	21.40	1.00	58.[illegible]0	4.[illegible]0	1.00	23.50	8.20	1.00
44.30	.90	1.00	29.80	11.70	1.00	26.20	5.40	1.00
54.[illegible]0	1.90	1.00	29.50	5.[illegible]0	1.00	49.90	3.60	1.00
3[illegible].50	5.80	1.00	54.[illegible]0	-10.[illegible]0	1.00	40.70	22.90	1.00
38.40	27.20	1.00	52.30	.80	1.00	39.80	13.60	1.00
32.50	7.90	1.00	43.20	7.40	1.00	27.70	6.30	1.00
47.10	1.20	1.00	36.[illegible]0	16.[illegible]0	1.00	47.70	8.90	1.00
3[illegible].[illegible]0	11.10	1.00	43.[illegible]0	6.[illegible]0	1.00	28.90	13.80	1.00
23.90	10.40	1.00	35.40	3.[illegible]0	1.00	7[illegible].[illegible]0	-10.00	1.00
46.60	25.20	1.00	13.[illegible]0	3.[illegible]0	1.00	26.40	12.40	1.00
34.80	.20	1.00	18.00	2.10	1.00	35.[illegible]0	2.80	1.00
29.40	12.50	1.00	25.[illegible]0	2.[illegible]0	1.00	17.30	5.70	1.00
39.50	.20	1.00	44.[illegible]0	21.[illegible]0	1.00	49.[illegible]0	9.30	1.00
56.50	[illegible]	1.00	37.[illegible]0	15.[illegible]0	1.00	42.60	5.70	1.00
39.20	9.10	1.00	32.[illegible]0	12.90	1.00	25.90	8.40	1.00
57.00	-10.00	1.00	37.40	14.60	1.00	45.70	13.90	1.00

48.80	6.10	1.00	29.70	7.90	1.00	33.70	14.40	1.00
41.20	21.90	1.00	56.40	[illegible]	1.00	40.20	10.70	1.00
49.30	2.70	1.00	48.[illegible]	34.30	1.00	26.10	8.80	1.00
29.90	8.00	1.00	15.20	3.60	1.00	38.40	-5.50	1.00
26.70	11.00	1.00	23.70	6.70	1.00	24.90	1.70	1.00
15.10	4.40	1.00	35.50	5.70	1.00	34.30	21.00	1.00
47.20	2.60	1.00	25.50	4.40	1.00	42.80	15.00	1.00
32.30	21.70	1.00	63.20	5.10	1.00	53.[illegible]	11.90	1.00
38.10	15.50	1.00	50.[illegible]	8.50	1.00	37.00	13.20	1.00
33.00	10.70	1.00	35.40	15.20	1.00	46.30	22.90	1.00
72.80	-10.[illegible]	1.00	35.30	14.[illegible]	1.00	43.20	5.60	1.00
22.[illegible]	3.[illegible]	1.00	39.[illegible]	[illegible]	1.00	12.50	1.10	1.00
39.40	6.90	1.00	25.70	11.[illegible]	1.00	27.60	14.50	1.00
49.60	3.70	1.00	40.50	10.20	1.00	44.90	.80	1.00
21.10	4.70	1.00	47.30	2.60	1.00	21.00	8.60	1.00
29.40	3.00	1.00	24.[illegible]	5.10	1.00	65.60	-10.00	1.00
21.50	.70	1.00	46.[illegible]	.10	1.00	37.10	3.90	1.00
38.70	.10	1.00	27.10	1.[illegible]	1.00	19.60	0.00	1.00
35.40	18.70	1.00	37.20	[illegible]	1.00	25.10	1.90	1.00
45.50	2.00	1.00	37.20	3.40	1.00	27.70	10.20	1.00
44.60	32.60	1.00	45.90	8.90	1.00	35.10	15.40	1.00
51.30	23.20	1.00	54.10	[illegible]	1.00	40.20	8.90	1.00
61.90	1.60	1.00	57.[illegible]	43.90	1.00	65.[illegible]	-10.00	1.00
31.60	6.50	1.00	26.[illegible]	3.[illegible]	1.00	57.90	.30	1.00
43.80	30.10	1.00	49.70	[illegible]	1.00	40.50	9.70	1.00
31.00	17.90	1.00	47.90	1.20	1.00	24.10	10.40	1.00
13.90	2.10	1.00	17.10	3.90	1.00	52.10	36.80	1.00
53.20	-.20	1.00	65.20	-1[illegible]	1.00	30.[illegible]	13.30	1.00
39.20	4.30	1.00	47.[illegible]	6.40	1.00	46.30	15.80	1.00
33.90	15.30	1.00	43.10	9.20	1.00	49.60	3.70	1.00
33.30	5.60	1.00	31.40	[illegible]	1.00	24.10	13.40	1.00
42.00	23.10	1.00	66.[illegible]	-2.[illegible]	1.00	13.30	1.40	1.00
34.30	11.20	1.00	43.20	[illegible]	1.00	40.20	9.60	1.00
39.70	10.20	1.00	47.70	.40	1.00	40.60	1.10	1.00
39.60	13.20	1.00	39.20	[illegible]	1.00	67.90	-10.00	1.00
37.50	14.10	1.00	45.30	1[illegible].40	1.00	29.10	17.60	1.00
54.[illegible]	7.40	1.00	40.20	21.[illegible]	1.00	28.10	8.50	1.00
55.80	2.90	1.00	48.[illegible]	27.10	1.00	31.00	3.60	1.00
22.00	8.00	1.00	63.40	-.70	1.00	50.70	11.40	1.00
[illegible]	4.10	1.00	45.[illegible]	.30	1.00	20.50	5.70	1.00
40.60	-.20	1.00	25.[illegible]	3.[illegible]	1.00	70.20	-10.00	1.00
32.40	12.[illegible]	1.00	31.[illegible]	[illegible]	1.00	34.30	2.00	1.00
33.50	19.10	1.00	44.[illegible]	9.70	1.00	55.80	1.30	1.00
[illegible]	4.60	1.00	23.[illegible]	8.30	1.00	45.30	6.[illegible]	1.00
35.90	10.40	1.00	32.70	[illegible]	1.00	64.70	6.30	1.00
47.[illegible]	18.70	1.00	37.[illegible]	13.40	1.00	42.40	9.60	1.00
45.40	15.80	1.00	30.[illegible]	15.[illegible]	1.00	58.[illegible]	7.10	1.00
49.50	11.50	1.00	74.[illegible]	-1[illegible]	1.00	34.[illegible]	11.90	1.00

49.80	8.50	1.00	71.60	5.20	1.00	50.10	28.40	1.00
28.80	3.60	1.00	44.10	10.10	1.00	58.00	-10.00	1.00
52.70	11.30	1.00	33.30	20.40	1.00	46.80	17.60	1.00
45.20	11.20	1.00	31.40	14.[illegible]	1.00	50.00	1.80	1.00
22.30	6.40	1.00	48.00	6.30	1.00	35.90	2.90	1.00
27.50	4.30	1.00	23.00	13.[illegible]	1.00	20.20	3.60	1.00
24.50	12.30	1.00	28.60	13.70	1.00	29.50	14.10	1.00
36.10	.30	1.00	43.90	-10.00	1.00	53.10	-10.00	1.00
59.90	10.70	1.00	41.50	9.70	1.00	25.90	15.30	1.00
47.00	6.40	1.00	41.00	14.60	1.00	35.90	21.70	1.00
52.30	7.30	1.00	45.00	.70	1.00	26.00	7.00	1.00
29.60	2.70	1.00	34.00	6.80	1.00	40.40	2.50	1.00
36.30	5.80	1.00	29.40	9.[illegible]	1.00	38.40	4.20	1.00
16.40	1.30	1.00	15.60	4.40	1.00	29.20	-1.40	1.00
21.90	2.00	1.00	32.30	.20	1.00	50.40	5.90	1.00
55.70	6.50	1.00	20.80	7.20	1.00	49.20	9.10	1.00
35.50	17.10	1.00	22.50	11.50	1.00	77.70	-10.00	1.00
32.40	10.30	1.00	41.30	5.50	1.00	59.70	5.20	1.00
25.40	5.80	1.00	23.30	8.70	1.00	76.70	1.70	1.00
23.40	7.50	1.00	38.50	11.50	1.00	63.20	6.10	1.00
18.10	2.20	1.00	35.00	1.40	1.00	48.80	35.10	1.00
63.20	-10.00	1.00	28.40	4.20	1.00	21.60	1.90	1.00
48.60	12.70	1.00	56.10	-.10	1.00	35.10	19.40	1.00
62.00	-2.30	1.00	25.40	10.30	1.00	39.50	3.00	1.00
25.70	12.20	1.00	32.90	1.30	1.00	19.40	8.90	1.00
29.00	5.40	1.00	41.30	[illegible]	1.00	24.00	10.40	1.00
37.00	7.80	1.00	25.70	[illegible]	1.00	33.50	18.20	1.00
58.[illegible]	-3.10	1.00	32.50	11.50	1.00	45.40	2.30	1.00
29.90	16.50	1.00	43.90	.30	1.00	39.70	2.10	1.00
30.90	8.20	1.00	49.10	.30	1.00	37.50	8.70	1.00
34.30	17.90	1.00	47.20	7.50	1.00	37.90	24.70	1.00
32.40	14.90	1.00	60.10	28.60	1.00	68.80	-10.00	1.00
27.80	14.30	1.00	39.30	7.60	1.00	53.30	3.90	1.00
31.50	11.90	1.00	63.80	15.40	1.00	68.50	-10.00	1.00
34.70	15.60	1.00	28.30	2.50	1.00	19.30	4.00	1.00
67.30	1.20	1.00	34.90	11.10	1.00	27.30	15.60	1.00
54.30	4.60	1.00	32.30	20.40	1.00	32.60	21.30	1.00
55.60	6.00	1.00	54.40	24.[illegible]	1.00	24.20	2.50	1.00
20.80	6.80	1.00	41.40	2.40	1.00	41.70	11.90	1.00
44.90	.60	1.00	24.30	14.30	1.00	34.50	17.00	1.00
35.10	14.40	1.00	62.10	6.50	1.00	43.50	23.50	1.00
54.40	9.60	1.00	71.30	-10.00	1.00	36.50	2.30	1.00
26.70	9.90	1.00	35.40	16.40	1.00	39.20	1.70	1.00
38.[illegible]	1.[illegible]	1.00	37.20	24.60	1.00	28.50	7.30	1.00
27.40	15.50	1.00	35.[illegible]	14.[illegible]	1.00	36.90	3.30	1.00
44.80	2.60	1.00	51.[illegible]	[illegible]	1.00	37.20	3.30	1.00
27.10	9.50	1.00	25.10	6.50	1.00	25.60	10.60	1.00
24.10	13.70	1.00	43.20	-.50	1.00	51.40	26.20	1.00
53.00	6.70	1.00	36.40	9.90	1.00	25.30	13.60	1.00
59.90	-10.00	1.00	27.00	7.90	1.00	16.70	4.30	1.00
33.00	0.[illegible]	1.00	23.[illegible]	.40	1.00	14.20	3.70	1.00
56.[illegible]	-1.20	1.00	52.70	1.[illegible]	1.00	42.20	29.60	1.00

15.70	.30	1.00	63.30	-10.00	1.00	30.50	16.50	1.00
34.50	3.20	1.00	62.00	1.40	1.00	29.80	1.40	1.00
34.00	3.70	1.00	56.30	-1.70	1.00	47.50	33.30	1.00
25.50	12.30	1.00	42.10	9.90	1.00	21.30	10.90	1.00
42.60	18.50	1.00	49.10	.70	1.00	40.40	26.20	1.00
39.50	12.00	1.00	43.30	12.[illegible]	1.00	44.50	4.80	1.00
33.80	7.40	1.00	36.20	-.40	1.00	15.60	.50	1.00
40.90	-.60	1.00	2[illegible]	.10	1.00	17.[illegible]	3.90	1.00
57.90	-1.10	1.00	2[illegible].40	11.10	1.00	41.30	[illegible].00	1.00
32.60	9.20	1.00	[illegible]	3.70	1.00	43.70	5.30	1.00
38.30	8.60	1.00	5[illegible]	.70	1.00	17.10	1.70	1.00
29.20	8.50	1.00	3[illegible].30	3.[illegible]	1.00	34.30	20.30	1.00
17.10	4.40	1.00	56.90	-1[illegible]	1.00	35.30	6.80	1.00
73.50	-10.00	1.00	46.30	16.[illegible]0	1.00	34.[illegible]	7.40	1.00
69.80	.40	1.00	36.00	2.30	1.00	36.50	6.90	1.00
35.40	15.50	1.00	34.40	15.[illegible]	1.00	56.30	1.60	1.00
39.50	14.60	1.00	4[illegible]	4.70	1.00	27.80	17.00	1.00
36.60	6.70	1.00	53.[illegible]	21.60	1.00	59.50	.70	1.00
43.10	1.80	1.00	43.40	-.40	1.00	33.80	22.60	1.00
26.60	9.40	1.00	4[illegible].20	2.10	1.00	56.50	2.20	1.00
49.20	3.50	1.00	22.[illegible]0	4.80	1.00	21.30	10.70	1.00
79.50	-10.00	1.00	45.30	26.50	1.00	22.50	9.20	1.00
57.30	.10	1.00	29.[illegible]	8.60	1.00	45.10	7.00	1.00
69.80	-.40	1.00	37.[illegible]	6.[illegible]0	1.00	37.70	27.30	1.00
4[illegible].40	6.50	1.00	25.10	11.70	1.00	28.10	11.50	1.00
57.[illegible]	4.70	1.00	56.40	4.70	1.00	32.70	19.40	1.00
22.50	8.30	1.00	35.[illegible]0	11.[illegible]	1.00	46.40	7.90	1.00
45.10	26.20	1.00	41.[illegible]	6.40	1.00	59.20	-2.50	1.00
42.40	4.20	1.00	35.[illegible]	19.20	1.00	22.10	7.80	1.00
13.40	1.20	1.00	41.40	[illegible]	1.00	16.10	5.80	1.00
43.60	1.60	1.00	36.[illegible]0	11.20	1.00	73.60	-10.00	1.00
45.50	12.[illegible]	1.00	54.40	11.30	1.00	25.70	.20	1.00
37.70	.20	1.00	27.[illegible]	16.50	1.00	56.50	-10.00	1.00
38.50	8.80	1.00	37.40	5.[illegible]0	1.00	50.30	.40	1.00
17.30	4.80	1.00	41.40	2.70	1.00	26.80	7.80	1.00
3[illegible]	5.10	1.00	34.50	5.10	1.00	15.20	5.70	1.00
36.40	17.50	1.00	54.90	[illegible]	1.00	32.40	13.20	1.00
54.00	.40	1.00	35.20	13.20	1.00	29.60	6.40	1.00
49.60	.20	1.00	15.[illegible]	.30	1.00	42.80	4.30	1.00
39.5	16.80	1.00	37.20	15.[illegible]	1.00	30.20	12.50	1.00
45.40	2.60	1.00	44.90	21.30	1.00	41.10	12.40	1.00
50.30	8.10	1.00	26.[illegible]	1[illegible]	1.00	60.10	-10.00	1.00
39.10	15.10	1.00	38.70	4.[illegible]	1.00	34.60	15.20	1.00
26.50	16.40	1.00	51.[illegible]	2.[illegible]	1.00	38.40	1.60	1.00
29.30	8.30	1.00	53.[illegible]	-.20	1.00	34.10	1.90	1.00
49.60	9.00	1.00	38.90	9.40	1.00	34.50	17.50	1.00
43.40	.30	1.00	45.80	2.40	1.00	45.[illegible]	33.30	1.00
24.20	7.40	1.00	47.20	2.10	1.00	25.10	2.90	1.00
45.40	4.70	1.00	53.30	2.30	1.00	41.20	23.90	1.00
28.10	7.30	1.00	27.[illegible]	1[illegible].60	1.00	58.90	-10.00	1.00
27.[illegible]	12.50	1.00	32.[illegible]	1[illegible]	1.00	27.40	10.60	1.00
55.50	5.60	1.00	26.[illegible]	1[illegible].50	1.00	29.90	17.90	1.00

59.40	-1.30	1.00	62.90	-10.00	1.00	46.60	10.30	1.00
26.60	10.60	1.00	47.70	33.60	1.00	61.30	8.10	1.00
28.30	8.60	1.00	23.50	2.70	1.00	24.40	6.00	1.00
34.90	22.40	1.00	40.60	29.20	1.00	42.40	1.90	1.00
25.60	3.90	1.00	49.00	.60	1.00	14.30	1.80	1.00
28.50	1.20	1.00	45.60	.40	1.00	42.00	6.50	1.00
14.70	3.70	1.00	17.30	1.90	1.00	15.10	1.30	1.00
49.90	-1.40	1.00	29.10	[illegible]	1.00	24.80	14.10	1.00
58.60	.70	1.00	34.50	5.60	1.00	26.80	13.10	1.00
30.60	15.30	1.00	39.00	.30	1.00	21.70	4.60	1.00
55.90	4.70	1.00	67.70	-10.00	1.00	41.40	21.20	1.00
54.20	-4.30	1.00	37.00	4.30	1.00	38.30	3.40	1.00
47.10	1.70	1.00	37.60	3.70	1.00	52.70	-10.00	1.00
35.90	14.90	1.00	32.70	14.70	1.00	42.50	5.40	1.00
48.80	2.60	1.00	44.20	7.30	1.00	40.00	12.40	1.00
41.70	2.70	1.00	34.50	7.40	1.00	32.60	19.60	1.00
35.20	3.20	1.00	43.90	2.20	1.00	50.20	.70	1.00
39.80	9.90	1.00	38.10	4.30	1.00	37.50	12.70	1.00
38.70	4.30	1.00	31.70	12.30	1.00	71.30	-10.00	1.00
53.40	1.80	1.00	41.60	31.40	1.00	51.20	9.80	1.00
35.00	15.50	1.00	60.40	-1.30	1.00	28.00	14.20	1.00
48.80	1.70	1.00	32.50	18.30	1.00	43.10	16.30	1.00
32.30	4.40	1.00	30.50	16.10	1.00	32.50	10.10	1.00
42.60	-.20	1.00	34.30	12.70	1.00	34.00	-.80	1.00
52.10	-.10	1.00	36.00	22.50	1.00	41.20	16.20	1.00
44.60	-.10	1.00	33.00	13.30	1.00	34.70	20.90	1.00
24.00	10.20	1.00	36.40	17.90	1.00	58.20	-10.00	1.00
37.30	3.60	1.00	15.30	3.70	1.00	48.60	2.80	1.00
45.20	22.50	1.00	13.50	6.10	1.00	24.70	11.70	1.00
37.00	2.70	1.00	44.50	1.30	1.00	26.90	6.60	1.00
50.20	1.10	1.00	38.80	4.30	1.00	34.90	21.20	1.00
27.40	10.10	1.00	40.70	27.70	1.00	52.70	-.70	1.00
38.40	2.10	1.00	33.30	8.60	1.00	32.40	18.80	1.00
22.90	2.90	1.00	47.80	1.30	1.00	17.90	1.80	1.00
31.00	16.60	1.00	35.00	1.70	1.00	28.50	10.90	1.00
62.70	-10.00	1.00	23.30	6.30	1.00	48.50	2.30	1.00
36.80	20.20	1.00	26.30	8.00	1.00	44.70	1.50	1.00
43.40	15.50	1.00	24.30	12.80	1.00	38.00	6.40	1.00
32.00	17.20	1.00	56.80	-.50	1.00	21.50	4.70	1.00
25.40	7.40	1.00	23.00	6.30	1.00	32.40	17.70	1.00
53.40	.40	1.00	23.00	3.00	1.00	55.20	.10	1.00
37.60	13.40	1.00	15.50	3.30	1.00	34.80	4.50	1.00
28.70	10.60	1.00	39.40	1.00	1.00	63.40	-10.00	1.00
70.70	-10.00	1.00	21.60	2.70	1.00	13.50	1.20	1.00
60.90	0.30	1.00	14.00	3.00	1.00	33.60	12.70	1.00
52.30	3.60	1.00	41.40	5.00	1.00	38.70	15.40	1.00
55.40	0.30	1.00	50.40	2.00	1.00	47.70	9.90	1.00
40.90	24.50	1.00	39.40	4.00	1.00	34.60	5.60	1.00
31.00	1.90	1.00	25.00	13.70	1.00	36.00	6.80	1.00
33.60	.40	1.00	32.50	6.70	1.00	45.60	0.00	1.00
37.20	14.00	1.00	33.70	15.30	1.00	49.70	5.80	1.00
31.20	19.10	1.00	52.60	[illegible]	1.00	20.60	10.60	1.00

42.20	2.60	1.00	19.30	5.70	1.00	48.20	4.30	1.00
29.70	8.90	1.00	21.[illegible]0	5.10	1.00	32.00	7.60	1.00
4[illegible].10	11.80	1.00	52.50	-.10	1.00	24.90	10.70	1.00
36.80	8.70	1.00	28.[illegible]	2.60	1.00	34.60	1.70	1.00
22.60	4.40	1.00	33.40	.[illegible]0	1.00	30.60	10.20	1.00
14.70	2.40	1.00	50.80	.[illegible]0	1.00	38.50	16.30	1.00
21.60	5.40	1.00	29.[illegible]0	.70	1.00	25.50	3.50	1.00
61.20	.50	1.00	41.30	1.[illegible]	1.00	27.50	3.20	1.00
5[illegible].[illegible]0	-10.00	1.00	23.[illegible]0	14.10	1.00	32.30	8.60	1.00
46.70	17.30	1.00	53.90	7.40	1.00	26.20	3.20	1.00
26.20	5.50	1.00	38.70	3.70	1.00	53.50	-3.60	1.00
32.60	8.30	1.00	33.10	7.80	1.00	41.90	3.50	1.00
33.90	8.20	1.00	41.[illegible]0	1.10	1.00	26.20	12.00	1.00
18.40	8.20	1.00	54.70	-1[illegible].[illegible]0	1.00	31.20	2.10	1.00
26.80	11.00	1.00	35.40	5.70	1.00	27.80	13.80	1.00
35.20	7.60	1.00	23.[illegible]0	12.70	1.00	30.6[illegible]	12.20	1.00
37.[illegible]	1.40	1.00	40.70	7.70	1.00	41.60	8.30	1.00
41.40	14.20	1.00	29.[illegible]0	10.40	1.00	32.20	16.90	1.00
61.90	2.40	1.00	27.70	8.50	1.00	31.3[illegible]	9.20	1.00
29.00	15.30	1.00	35.[illegible]0	17.[illegible]0	1.00	64.70	-10.00	1.00
42.90	20.70	1.00	27.70	11.[illegible]0	1.00	23.90	5.40	1.00
24.10	9.50	1.00	31.[illegible]0	15.70	1.00	47.40	4.00	1.00
33.60	14.70	1.00	29.10	12.40	1.00	37.10	22.90	1.00
48.30	-.70	1.00	36.40	1[illegible].[illegible]	1.00	3[illegible].80	10.30	1.00
45.30	2.70	1.00	37.10	16.50	1.00	41.30	3.90	1.00
35.30	22.50	1.00	20.70	5.[illegible]0	1.00	41.30	9.40	1.00
47.30	2.70	1.00	44.[illegible]0	1[illegible].[illegible]0	1.00	37.[illegible]	11.60	1.00
44.50	11.60	1.00	69.70	-1[illegible].[illegible]0	1.00	37.70	15.10	1.00
24.90	7.80	1.00	27.[illegible]0	[illegible].60	1.00	34.60	3.00	1.00
31.80	7.60	1.00	32.50	17.90	1.00	33.40	11.60	1.00
39.10	4.70	1.00	31.[illegible]0	6.30	1.00	23.10	11.20	1.00
23.40	8.80	1.00	3[illegible].40	11.50	1.00	40.60	1.70	1.00
27.10	6.10	1.00	3[illegible].10	8.[illegible]0	1.00	31.6[illegible]	7.50	1.00
50.50	-10.[illegible]0	1.00	26.90	12.50	1.00	46.70	2.10	1.00
26.50	12.90	1.00	36.30	15.[illegible]0	1.00	40.20	4.30	1.00
27.[illegible]	7.40	1.00	56.10	-1[illegible].[illegible]0	1.00	45.90	12.40	1.00
54.70	8.20	1.00	26.40	9.70	1.00	33.[illegible]	8.50	1.00
5[illegible].60	3.00	1.00	29.[illegible]0	2.60	1.00	16.00	1.10	1.00
44.40	.10	1.00	34.10	1[illegible].[illegible]0	1.00	41.80	1.30	1.00
47.90	0.00	1.00	3[illegible].[illegible]0	.70	1.00	28.40	15.10	1.00
20.20	.10	1.00	43.[illegible]0	4.70	1.00	20.20	8.70	1.00
49.70	-.60	1.00	44.[illegible]0	1[illegible].[illegible]0	1.00	21.30	.60	1.00
34.70	.60	1.00	3[illegible].[illegible]0	5.40	1.00	39.50	5.80	1.00
39.8	18.60	1.00	45.[illegible]0	-.[illegible]0	1.00	35.8[illegible]	22.90	1.00
41.70	.80	1.00	21.[illegible]0	5.[illegible]0	1.00	29.20	5.50	1.00
51.90	3.50	1.00	56.[illegible]0	-2.30	1.00	38.30	2.30	1.00
41.20	17.70	1.00	51.[illegible]0	-.10	1.00	48.[illegible]0	10.40	1.00
42.5[illegible]	27.20	1.00	4[illegible].[illegible]0	2[illegible].[illegible]0	1.00	57.[illegible]	-1[illegible].00	1.00
24.50	4.30	1.00	3[illegible].[illegible]0	21.40	1.00	68.70	-10.[illegible]0	1.00
25.30	7.[illegible]0	1.00	52.[illegible]0	2.40	1.00	40.30	15.50	1.00
30.00	5.60	1.00	63.10	.70	1.00	41.90	14.50	1.00
41.60	5.40	1.00	35.[illegible]0	21.[illegible]0	1.00	39.30	12.80	1.00

53.10	1.10	1.00	68.[illegible]	-2.10	1.00	55.50	3.00	1.00
63.90	2.40	1.00	54.20	16.[illegible]	1.00	59.50	4.50	1.00
43.00	32.60	1.00	[illegible]	19.90	1.00	52.20	14.00	1.00
58.60	.50	1.00	24.30	10.10	1.00	27.20	5.90	1.00
21.40	6.80	1.00	43.[illegible]	1.20	1.00	36.90	5.00	1.00
32.20	1.60	1.00	43.40	7.30	1.00	23.40	12.40	1.00
34.10	6.90	1.00	[illegible]	7.50	1.00	71.60	-10.00	1.00
12.40	4.60	1.00	23.20	13.40	1.00	69.40	3.80	1.00
39.60	7.50	1.00	26.[illegible]	1.30	1.00	79.00	1.80	1.00
46.50	35.30	1.00	73.20	-13.[illegible]	1.00	27.70	5.20	1.00
39.20	13.40	1.00	47.[illegible]	11.50	1.00	43.40	2.30	1.00
33.40	3.00	1.00	23.30	11.50	1.00	18.60	3.40	1.00
35.90	12.50	1.00	42.30	1.[illegible]	1.00	67.90	-.10	1.00
62.50	3.70	1.00	41.70	2.[illegible]	1.00	33.50	12.70	1.00
25.80	15.10	1.00	39.80	12.[illegible]	1.00	47.50	-.70	1.00
42.80	13.40	1.00	[illegible]	28.[illegible]	1.00	36.30	14.90	1.00
53.20	2.10	1.00	52.70	33.70	1.00	59.00	-4.00	1.00
34.30	23.10	1.00	17.10	4.70	1.00	20.10	3.70	1.00
51.30	5.70	1.00	36.50	19.80	1.00	18.50	6.70	1.00
55.40	6.20	1.00	31.80	17.20	1.00	54.90	29.90	1.00
64.60	-10.70	1.00	44.50	17.50	1.00	42.20	10.90	1.00
43.60	10.20	1.00	43.40	15.60	1.00	45.50	17.00	1.00
56.10	15.30	1.00	56.70	-10.[illegible]	1.00	44.60	21.20	1.00
32.50	15.50	1.00	55.[illegible]	9.40	1.00	28.70	14.40	1.00
34.30	7.60	1.00	37.[illegible]	6.[illegible]	1.00	50.10	.60	1.00
37.50	9.50	1.00	41.[illegible]	2.90	1.00	55.60	-.80	1.00
29.40	17.90	1.00	32.30	5.60	1.00	27.90	6.20	1.00
42.00	-6.90	1.00	23.40	8.30	1.00	45.80	1.10	1.00
42.80	5.20	1.00	39.70	5.90	1.00	33.60	17.80	1.00
45.90	4.10	1.00	31.[illegible]	9.60	1.00	37.40	17.10	1.00
51.90	-10.30	1.00	22.30	7.[illegible]	1.00	29.20	9.90	1.00
29.50	14.10	1.00	42.20	6.10	1.00	32.[illegible]	5.00	1.00
51.20	1.30	1.00	25.20	13.[illegible]	1.00	31.90	4.20	1.00
42.00	1.30	1.00	46.70	1.20	1.00	42.00	.40	1.00
49.10	3.90	1.00	65.40	-.30	1.00	52.30	13.30	1.00
35.20	18.50	1.00	43.10	5.[illegible]	1.00	48.40	34.60	1.00
39.40	6.50	1.00	53.30	3.40	1.00	78.20	-10.00	1.00
47.90	21.60	1.00	18.[illegible]	3.60	1.00	23.00	1.90	1.00
45.70	1.50	1.00	44.90	2.30	1.00	17.90	2.90	1.00
36.2[illegible]	16.30	1.00	36.[illegible]	2.[illegible]	1.00	27.00	7.00	1.00
39.3[illegible]	-1.70	1.00	61.70	-1[illegible]	1.00	36.30	19.00	1.00
41.40	7.00	1.00	27.[illegible]	15.50	1.00	32.10	16.40	1.00
27.80	17.20	1.00	43.20	4.20	1.00	23.00	9.10	1.00
32.30	5.40	1.00	30.[illegible]	[illegible].10	1.00	24.[illegible]	1.80	1.00
32.90	3.00	1.00	30.70	17.10	1.00	35.60	.40	1.00
34.00	11.10	1.00	42.00	.[illegible]	1.00	37.50	23.80	1.00
29.50	7.50	1.00	31.40	1.30	1.00	41.30	4.30	1.00
39.70	25.[illegible]	1.00	20.[illegible]	5.[illegible]	1.00	45.70	31.60	1.00
57.50	-.10	1.00	15.[illegible]	5.1[illegible]	1.00	53.40	.30	1.00
23.70	5.20	1.00	47.[illegible]	1.40	1.00	38.50	18.50	1.00
41.60	6.10	1.00	30.40	1[illegible].00	1.00	42.70	24.20	1.00
44.80	7.70	1.00	31.[illegible]	[illegible]	1.00	65.30	-10.00	1.00

33.80	23.60	1.00	21.70	8.70	1.00	50.10	3.60	1.00
54.00	0.00	1.00	28.50	11.60	1.00	42.90	3.20	1.00
39.50	29.10	1.00	40.10	22.30	1.00	36.60	2.00	1.00
20.30	4.90	1.00	53.20	4.[illegible]	1.00	43.30	7.10	1.00
42.40	16.30	1.00	54.40	-2.[illegible]	1.00	45.90	4.50	1.00
28.70	4.60	1.00	62.90	-10.00	1.00	51.10	3.60	1.00
38.60	10.90	1.00	46.[illegible]	10.70	1.00	37.50	18.50	1.00
13.40	3.00	1.00	56.[illegible]	-.50	1.00	38.20	1.00	1.00
33.30	3.20	1.00	33.30	17.30	1.00	57.90	1.40	1.00
45.20	2.00	1.00	32.30	14.80	1.00	29.50	14.40	1.00
64.40	-10.00	1.00	46.40	10.50	1.00	43.30	6.10	1.00
47.80	.20	1.00	21.60	8.40	1.00	24.80	4.50	1.00
32.60	4.10	1.00	38.90	3.20	1.00	34.70	14.10	1.00
41.00	-.40	1.00	32.50	13.30	1.00	29.40	3.50	1.00
23.50	13.30	1.00	30.50	2.60	1.00	47.20	-.60	1.00
26.80	7.30	1.00	27.10	8.10	1.00	45.10	5.30	1.00
27.40	12.10	1.00	49.80	1.30	1.00	36.70	11.70	1.00
31.90	13.50	1.00	43.30	5.30	1.00	29.00	13.60	1.00
31.30	8.90	1.00	36.90	16.40	1.00	51.80	-10.00	1.00
37.20	18.30	1.00	31.40	16.60	1.00	47.30	14.30	1.00
45.60	7.10	1.00	38.00	27.40	1.00	42.10	14.10	1.00
26.00	11.10	1.00	57.50	-10.00	1.00	34.40	16.10	1.00
25.90	6.40	1.00	49.70	17.80	1.00	43.50	24.90	1.00
37.20	21.60	1.00	55.80	2.30	1.00	29.70	18.70	1.00
17.30	5.80	1.00	25.[illegible]	6.30	1.00	44.20	.10	1.00
36.10	19.40	1.00	37.30	.50	1.00	29.20	4.30	1.00
22.20	8.90	1.00	26.60	18.20	1.00	36.80	6.50	1.00
48.[illegible]	17.30	1.00	51.70	-.10	1.00	52.50	.30	1.00
34.50	20.20	1.00	37.[illegible]	3.20	1.00	22.90	8.20	1.00
41.00	1.50	1.00	16.40	1.40	1.00	40.80	.40	1.00
28.20	5.70	1.00	36.[illegible]	6.10	1.00	27.30	11.60	1.00
24.00	10.30	1.00	40.30	2.00	1.00	63.90	-10.00	1.00
38.30	5.50	1.00	52.50	.70	1.00	24.30	11.50	1.00
48.20	0.00	1.00	32.[illegible]	6.60	1.00	40.00	1.20	1.00
28.10	11.60	1.00	39.20	1.30	1.00	38.70	28.00	1.00
25.50	5.00	1.00	38.[illegible]	16.[illegible]	1.00	47.70	2.40	1.00
43.10	2.60	1.00	30.40	6.50	1.00	23.00	8.30	1.00
36.90	20.50	1.00	39.70	6.30	1.00	30.90	15.30	1.00
38.40	7.40	1.00	33.00	22.40	1.00	62.30	-10.00	1.00
38.70	23.20	1.00	41.[illegible]	2.80	1.00	32.40	6.10	1.00
41.80	16.90	1.00	57.[illegible]	.10	1.00	14.80	.80	1.00
53.90	5.60	1.00	29.[illegible]	11.60	1.00	52.10	19.20	1.00
60.20	1.60	1.00	25.30	3.20	1.00	39.50	14.40	1.00
32.70	14.40	1.00	30.40	18.[illegible]	1.00	54.90	8.30	1.00
54.80	24.60	1.00	60.40	-10.00	1.00	45.20	14.20	1.00
21.20	-2.10	1.00	23.10	9.[illegible]	1.00	57.20	0.00	1.00
22.80	12.00	1.00	53.40	9.10	1.00	26.[illegible]	11.40	1.00
58.20	.90	1.00	13.[illegible]	4.30	1.00	37.50	19.60	1.00
32.[illegible]	1.90	1.00	41.70	7.30	1.00	28.50	10.50	1.00
43.80	1.60	1.00	29.[illegible]	14.30	1.00	39.90	10.40	1.00
51.60	11.20	1.00	58.30	8.[illegible]	1.00	64.60	7.10	1.00
71.50	-10.[illegible]	1.00	53.[illegible]	24.[illegible]	1.00	35.80	6.90	1.00

57.70	-10.00	1.00	39.10	8.40	1.00	36.90	1.20	1.00
22.60	7.30	1.00	25.40	5.30	1.00	32.[illegible]	10.90	1.00
34.00	4.30	1.00	26.30	6.10	1.00	24.30	10.50	1.00
19.90	4.30	1.00	13.60	9.70	1.00	24.20	4.50	1.00
43.40	10.50	1.00	29.40	18.70	1.00	45.80	-.30	1.00
39.90	26.10	1.00	42.30	19.40	1.00	36.70	4.70	1.00
36.40	6.00	1.00	36.[illegible]	3.70	1.00	46.70	6.70	1.00
45.40	21.70	1.00	48.20	4.40	1.00	26.80	9.30	1.00
55.40	.20	1.00	43.60	22.[illegible]	1.00	37.20	.40	1.00
30.10	16.50	1.00	34.40	14.10	1.00	31.70	4.90	1.00
33.80	22.10	1.00	52.[illegible]	.[illegible]	1.00	44.20	24.40	1.00
24.00	10.70	1.00	66.60	-10.[illegible]	1.00	50.[illegible]	21.00	1.00
51.10	-4.70	1.00	41.30	2.70	1.00	22.20	9.00	1.00
20.10	10.00	1.00	33.[illegible]	7.30	1.00	27.80	9.90	1.00
28.60	8.10	1.00	23.40	13.[illegible]	1.00	35.40	9.30	1.00
25.80	12.60	1.00	7[illegible].40	-2.60	1.00	32.20	19.30	1.00
57.20	-2.[illegible]	1.00	31.10	1.20	1.00	41.20	3.40	1.00
29.50	13.90	1.00	27.70	10.40	1.00	49.10	7.80	1.00
24.60	8.90	1.00	71.10	-10.[illegible]	1.00	32.60	13.50	1.00
39.60	2.60	1.00	2[illegible].50	7.[illegible]	1.00	23.40	10.80	1.00
33.90	8.70	1.00	27.30	16.70	1.00	43.20	-2.20	1.00
15.10	1.80	1.00	25.20	.20	1.00	15.90	2.50	1.00
33.50	-.60	1.00	29.40	3.60	1.00	26.30	8.70	1.00
21.80	11.40	1.00	47.[illegible]	-1[illegible]	1.00	4[illegible]	26.80	1.00
43.10	4.10	1.00	4[illegible].50	2.40	1.00	34.[illegible]	7.00	1.00
24.90	5.60	1.00	59.70	1.30	1.00	56.70	32.90	1.00
31.50	12.90	1.00	25.[illegible]	13.[illegible]	1.00	34.50	3.50	1.00
40.60	13.80	1.00	34.[illegible]	22.30	1.00	34.[illegible]	19.10	1.00
56.70	2.[illegible]	1.00	71.60	-1[illegible]	1.00	42.10	3.40	1.00
31.40	16.10	1.00	4[illegible]	5.20	1.00	48.10	7.30	1.00
38.40	24.40	1.00	38.20	12.70	1.00	29.90	11.00	1.00
52.50	2.10	1.00	29.[illegible]	3.[illegible]	1.00	26.40	14.90	1.00
42.00	5.40	1.00	39.30	6.20	1.00	32.20	18.90	1.00
19.70	8.30	1.00	35.40	19.[illegible]	1.00	46.80	-10.00	1.00
42.50	23.90	1.00	44.20	-.60	1.00	40.90	10.10	1.00
28.30	14.40	1.00	23.30	11.10	1.00	39.20	5.90	1.00
34.30	16.[illegible]	1.00	33.70	19.[illegible]	1.00	25.50	15.90	1.00
42.60	16.60	1.00	43.30	4.[illegible]	1.00	38.80	2.70	1.00
52.40	-1[illegible]	1.00	26.20	4.30	1.00	42.60	2.90	1.00
39.40	15.[illegible]	1.00	21.10	2.70	1.00	44.40	17.00	1.00
49.[illegible]	.70	1.00	23.[illegible]	.70	1.00	26.70	6.30	1.00
44.80	4.70	1.00	55.[illegible]	[illegible]	1.00	31.30	9.70	1.00
37.40	6.20	1.00	32.[illegible]	14.[illegible]	1.00	56.40	.40	1.00
31.60	15.10	1.00	35.[illegible]	4.40	1.00	36.30	1[illegible].10	1.00
47.90	-2.20	1.00	24.[illegible]	9.90	1.00	39.60	4.50	1.00
23.20	6.80	1.00	47.60	.10	1.00	36.70	5.60	1.00
37.30	5.[illegible]	1.00	45.[illegible]	4.[illegible]	1.00	42.70	31.90	1.00
26.10	4.70	1.00	47.10	4.[illegible]	1.00	55.30	[illegible]	1.00

29.70	17.10	1.00	25.10	9.70	1.00	39.20	11.30	1.00
47.40	5.20	1.00	31.00	6.50	1.00	33.00	18.60	1.00
61.50	-10.00	1.00	24.40	.70	1.00	41.30	3.00	1.00
44.10	.90	1.00	27.00	7.00	1.00	43.80	6.50	1.00
29.40	11.00	1.00	33.30	1[illegible]	1.00	37.40	11.10	1.00
46.10	34.70	1.00	57.30	-.20	1.00	49.30	20.60	1.00
58.10	-10.00	1.00	33.30	22.[illegible]	1.00	32.70	19.80	1.00
36.60	7.00	1.00	33.40	1.60	1.00	49.80	1.50	1.00
47.40	13.90	1.00	32.70	13.[illegible]	1.00	46.80	-2.80	1.00
35.10	16.10	1.00	31.40	4.[illegible]	1.00	62.30	-10.00	1.00
26.30	11.60	1.00	28.20	11.10	1.00	49.70	6.90	1.00
43.10	15.30	1.00	31.40	11.[illegible]	1.00	46.90	1.50	1.00
45.00	4.80	1.00	31.30	5.40	1.00	51.80	.50	1.00
43.70	37.70	1.00	33.50	25.60	1.00	27.[illegible]	12.50	1.00
41.00	6.30	1.00	45.60	2.50	1.00	49.40	2.50	1.00
33.70	15.90	1.00	41.70	-.10	1.00	33.90	18.30	1.00
35.10	17.90	1.00	41.[illegible]	6.[illegible]	1.00	38.10	27.30	1.00
49.30	-10.00	1.00	40.80	27.90	1.00	35.50	6.10	1.00
34.40	6.30	1.00	23.[illegible]	8.50	1.00	44.30	5.10	1.00
28.20	2.90	1.00	49.30	.10	1.00	27.70	14.20	1.00
40.60	19.20	1.00	48.10	-5.[illegible]	1.00	41.[illegible]	1.40	1.00
35.90	-.50	1.00	34.10	2.10	1.00	48.50	.60	1.00
46.20	23.10	1.00	39.10	7.30	1.00	43.70	6.00	1.00
33.10	17.20	1.00	26.40	16.[illegible]	1.00	28.50	11.40	1.00
44.50	19.60	1.00	8[illegible]	-11.40	1.00	22.70	9.10	1.00
25.60	9.60	1.00	3[illegible]	6.10	1.00	59.20	[illegible]	1.00
42.10	8.10	1.00	70.90	[illegible]	1.00	25.50	12.10	1.00
34.90	1.00	1.00	6[illegible]	[illegible]	1.00	37.[illegible]	1.90	1.00
50.60	14.60	1.00	34.30	2[illegible].10	1.00	51.[illegible]	.20	1.00
40.30	15.10	1.00	42.[illegible]	[illegible]	1.00	59.80	2.40	1.00
73.60	-10.00	1.00	26.00	9.[illegible]	1.00	36.40	8.00	1.00
21.70	11.30	1.00	2[illegible]	10.10	1.00	20.70	10.10	1.00
51.80	6.70	1.00	3[illegible]	17.[illegible]	1.00	20.50	4.00	1.00
16.90	5.70	1.00	24.20	[illegible]	1.00	31.80	3.80	1.00
40.8[illegible]	-.10	1.00	36.[illegible]	1[illegible]	1.00	54.[illegible]	16.50	1.00
54.30	-3.00	1.00	44.[illegible]	11.[illegible]	1.00	25.20	5.30	1.00
38.70	27.50	1.00	5[illegible].70	-.10	1.00	33.40	17.00	1.00
41.3[illegible]	28.[illegible]	1.00	7[illegible]	-1[illegible]	1.00	39.50	26.70	1.00
45.60	9.[illegible]	1.00	33.[illegible]	11.[illegible]	1.00	24.60	6.90	1.00
33.60	1.[illegible]	1.00	2[illegible]	11.70	1.00	19.90	9.30	1.00
26.60	3.20	1.00	32.[illegible]	-.10	1.00	28.70	3.80	1.00
43.20	9.60	1.00	54.[illegible]	-1[illegible]	1.00	23.[illegible]	12.80	1.00
26.20	-.30	1.00	4[illegible]	7.60	1.00	41.20	.90	1.00
32.10	6.50	1.00	32.[illegible]	11.[illegible]	1.00	42.[illegible]	3.70	1.00
[illegible]	9.[illegible]	1.00	6[illegible].40	-1[illegible]	1.00	17.10	5.30	1.00
27.30	2.10	1.00	4[illegible]	1[illegible].40	1.00	48.70	.30	1.00
41.20	12.70	1.00	41.40	6.[illegible]	1.00	61.40	-.90	1.00
32.80	1.60	1.00	43.[illegible]	1.[illegible]	1.00	32.30	14.90	1.00
15.90	6.[illegible]	1.00	32.70	3.[illegible]	1.00	30.30	1[illegible].60	1.00
31.4[illegible]	19.[illegible]	1.00	31.70	12.[illegible]	1.00	47.40	6.00	1.00
[illegible]	8.[illegible]	1.00	35.[illegible]	7.10	1.00	51.70	3.00	1.00
41.70	7.10	1.00	27.70	14.10	1.00	63.10	-10.00	1.00

40.50	2.00	1.00	26.00	5.10	1.00	65.20	-10.00	1.00
43.90	3.70	1.00	42.00	29.70	1.00	21.40	10.50	1.00
53.00	4.40	1.00	69.50	-10.00	1.00	42.90	4.70	1.00
32.40	3.10	1.00	43.00	24.10	1.00	43.00	25.40	1.00
45.10	3.60	1.00	39.00	5.10	1.00	44.00	2.70	1.00
40.40	28.50	1.00	40.00	10.70	1.00	38.00	19.60	1.00
29.50	19.00	1.00	29.30	12.60	1.00	29.80	9.20	1.00
60.60	6.20	1.00	48.20	19.50	1.00	49.40	-2.50	1.00
46.70	-2.30	1.00	28.00	13.10	1.00	18.70	2.90	1.00
20.60	4.40	1.00	18.30	5.20	1.00	25.20	10.50	1.00
52.40	2.10	1.00	22.00	6.40	1.00	23.60	8.70	1.00
42.70	23.40	1.00	61.90	1.60	1.00	15.10	5.00	1.00
42.10	1.90	1.00	32.20	19.10	1.00	34.80	3.60	1.00
37.90	8.30	1.00	66.20	-10.00	1.00	39.50	4.10	1.00
31.20	6.50	1.00	31.10	19.20	1.00	37.50	26.00	1.00
40.30	3.70	1.00	31.40	8.90	1.00	47.10	8.90	1.00
32.90	16.00	1.00	38.00	10.20	1.00	51.00	8.90	1.00
51.10	9.60	1.00	32.90	14.90	1.00	64.40	-10.00	1.00
26.90	14.00	1.00	33.00	13.40	1.00	28.10	5.10	1.00
24.90	9.10	1.00	57.70	-.70	1.00	46.90	29.50	1.00
40.30	2.30	1.00	49.70	2.60	1.00	21.30	6.20	1.00
34.90	3.20	1.00	43.20	3.50	1.00	33.20	23.10	1.00
38.10	16.40	1.00	43.10	11.20	1.00	30.40	4.90	1.00
57.40	-10.00	1.00	42.40	17.60	1.00	43.70	13.80	1.00
37.80	20.50	1.00	47.00	-2.10	1.00	41.70	1.10	1.00
13.70	3.50	1.00	25.70	5.20	1.00	19.40	5.50	1.00
37.40	1.20	1.00	30.00	6.10	1.00	29.50	11.40	1.00
58.00	34.30	1.00	74.20	-10.00	1.00	31.70	13.60	1.00
25.70	10.70	1.00	34.80	13.70	1.00	61.80	1.60	1.00
46.10	7.40	1.00	56.40	2.40	1.00	22.10	4.00	1.00
18.30	7.40	1.00	40.30	.90	1.00	22.40	6.60	1.00
31.30	3.40	1.00	26.10	15.00	1.00	14.80	4.70	1.00
38.50	9.00	1.00	67.20	.70	1.00	74.60	-10.00	1.00
52.00	14.90	1.00	42.30	5.60	1.00	25.60	12.00	1.00
52.70	32.20	1.00	56.00	.70	1.00	16.90	6.80	1.00
55.70	1.30	1.00	38.70	27.80	1.00	38.70	23.20	1.00
44.70	11.10	1.00	40.30	14.40	1.00	43.60	9.70	1.00
29.50	5.70	1.00	58.80	-.60	1.00	52.50	32.40	1.00
64.40	18.10	1.00	58.50	-5.00	1.00	32.80	2.20	1.00
26.50	.10	1.00	29.20	12.30	1.00	42.40	1.30	1.00
30.20	5.70	1.00	17.40	6.10	1.00	30.30	5.00	1.00
16.40	5.70	1.00	24.90	10.10	1.00	37.90	12.10	1.00
70.00	-10.00	1.00	25.10	7.20	1.00	62.60	.90	1.00
14.00	2.90	1.00	22.40	9.70	1.00	26.60	13.40	1.00
41.10	4.30	1.00	35.00	15.00	1.00	45.50	32.00	1.00
47.30	-.10	1.00	56.00	4.90	1.00	76.30	-10.00	1.00
46.20	4.50	1.00	25.00	15.30	1.00	38.70	1.10	1.00
48.50	.50	1.00	35.00	1.70	1.00	23.00	4.50	1.00
27.20	4.40	1.00	20.30	6.70	1.00	25.40	4.10	1.00
46.50	-.80	1.00	15.10	4.10	1.00	32.40	1.60	1.00
30.70	7.80	1.00	38.10	4.40	1.00	37.00	21.20	1.00
29.50	8.00	1.00	57.10	-.40	1.00	22.90	4.30	1.00

25.60	4.00	1.00	25.30	3.50	1.00	38.20	-2.80	1.00
19.60	3.30	1.00	43.30	1.00	1.00	34.70	22.80	1.00
34.20	3.80	1.00	33.20	5.10	1.00	17.50	4.50	1.00
70.20	-10.00	1.00	34.00	11.10	1.00	30.10	7.60	1.00
43.10	29.90	1.00	48.20	1.20	1.00	29.40	19.20	1.00
46.30	-.20	1.00	46.20	20.10	1.00	40.70	3.10	1.00
42.60	21.60	1.00	52.00	.10	1.00	27.70	4.90	1.00
52.10	2.10	1.00	25.60	5.50	1.00	47.40	1.10	1.00
29.70	12.00	1.00	29.30	7.00	1.00	24.30	11.10	1.00
68.90	1.00	1.00	47.80	11.50	1.00	23.20	12.90	1.00
27.80	7.20	1.00	32.10	7.50	1.00	28.90	13.70	1.00
31.50	18.60	1.00	41.40	1.70	1.00	70.40	-10.00	1.00
36.00	-.40	1.00	54.30	4.10	1.00	38.40	26.90	1.00
51.30	14.00	1.00	32.40	16.70	1.00	43.70	26.50	1.00
53.40	10.00	1.00	46.30	29.60	1.00	21.10	6.60	1.00
55.60	4.10	1.00	24.20	7.30	1.00	59.40	.40	1.00
25.70	8.10	1.00	15.00	2.40	1.00	28.70	16.60	1.00
41.60	2.10	1.00	25.00	8.70	1.00	17.40	6.90	1.00
69.30	-10.00	1.00	34.60	9.00	1.00	24.50	14.30	1.00
39.40	-8.90	1.00	39.10	.30	1.00	31.80	.30	1.00
37.90	8.20	1.00	28.30	16.80	1.00	38.50	-1.60	1.00
36.10	1.00	1.00	30.10	12.60	1.00	26.40	12.90	1.00
34.60	-.20	1.00	50.70	10.60	1.00	78.90	-10.90	1.00
50.10	5.20	1.00	23.60	7.00	1.00	72.60	2.80	1.00
23.90	14.20	1.00	30.00	7.20	1.00	49.60	2.10	1.00
58.80	3.00	1.00	56.00	7.10	1.00	33.10	23.10	1.00
39.90	10.80	1.00	49.40	9.70	1.00	70.00	-10.00	1.00
55.20	5.30	1.00	42.30	32.10	1.00	25.40	15.20	1.00
36.90	19.10	1.00	42.40	1.10	1.00	70.00	.20	1.00
31.90	8.20	1.00	52.60	5.60	1.00	35.60	17.20	1.00
28.80	10.30	1.00	51.30	38.50	1.00	60.30	.10	1.00
47.00	3.00	1.00	42.20	7.40	1.00	40.20	9.80	1.00
77.50	-10.00	1.00	33.00	17.50	1.00	24.50	3.70	1.00
40.50	1.60	1.00	54.00	[illegible]	1.00	58.60	20.30	1.00
50.70	25.40	1.00	44.30	2.50	1.00	17.80	4.60	1.00
25.60	5.60	1.00	21.30	8.70	1.00	25.90	7.60	1.00
33.00	3.60	1.00	28.30	3.70	1.00	28.80	8.70	1.00
53.90	.40	1.00	28.40	13.70	1.00	25.80	3.30	1.00
23.00	11.60	1.00	23.00	5.00	1.00	62.60	-10.00	1.00
21.40	.40	1.00	53.50	11.50	1.00	56.60	1.20	1.00
45.50	5.60	1.00	45.40	3.30	1.00	45.00	8.10	1.00
59.60	0.00	1.00	31.30	2.00	1.00	28.80	14.90	1.00
54.10	.10	1.00	24.10	5.20	1.00	55.00	.10	1.00
46.80	12.60	1.00	37.00	5.30	1.00	43.90	1.30	1.00
33.90	2.20	1.00	15.00	5.00	1.00	40.80	-5.10	1.00
27.00	13.30	1.00	41.00	2.70	1.00	23.50	4.00	1.00
35.20	2.90	1.00	13.20	5.00	1.00	35.10	3.10	1.00
45.30	-.10	1.00	34.00	[illegible]	1.00	36.20	6.60	1.00
36.50	1.90	1.00	45.10	2.00	1.00	32.00	3.30	1.00
24.10	8.00	1.00	30.00	17.00	1.00	37.00	18.10	1.00
[illegible]	-10.00	1.00	55.40	1.30	1.00	64.00	-10.00	1.00
50.80	.30	1.00	33.00	4.70	1.00	23.40	11.80	1.00

24.10	.30	1.00	38.70	5.60	1.00	22.70	7.00	1.00
38.10	10.70	1.00	51.30	-.40	1.00	38.50	10.00	1.00
36.80	6.40	1.00	36.70	14.90	1.00	29.90	2.20	1.00
32.50	.80	1.00	31.10	[illegible]	1.00	32.80	3.60	1.00
30.70	5.70	1.00	42.90	-.10	1.00	36.90	7.60	1.00
43.10	12.20	1.00	45.60	4.60	1.00	32.70	9.80	1.00
43.40	20.70	1.00	40.20	28.20	1.00	66.30	-10.00	1.00
23.90	11.50	1.00	56.90	.20	1.00	44.60	10.40	1.00
36.90	2.40	1.00	63.60	-2.30	1.00	23.40	6.70	1.00
36.30	.40	1.00	20.90	8.70	1.00	18.20	0.00	1.00
37.10	-.70	1.00	51.30	-1.10	1.00	30.80	7.30	1.00
35.50	12.00	1.00	47.50	-.40	1.00	36.50	13.40	1.00
51.50	-2.50	1.00	34.10	17.10	1.00	58.10	2.40	1.00
41.00	6.30	1.00	40.60	4.20	1.00	32.10	12.60	1.00
42.40	3.50	1.00	37.60	7.60	1.00	[illegible]	5.10	1.00
62.50	-10.00	1.00	[illegible]	19.40	1.00	43.10	11.00	1.00
55.90	3.10	1.00	54.50	18.50	1.00	60.40	1.00	1.00
31.50	.50	1.00	36.00	12.30	1.00	37.50	16.40	1.00
[illegible]	16.50	1.00	54.00	5.20	1.00	26.50	9.10	1.00
27.20	13.90	1.00	31.70	21.50	1.00	49.30	6.30	1.00
28.50	9.10	1.00	32.10	9.10	1.00	54.60	-10.00	1.00
27.40	.70	1.00	32.30	8.30	1.00	51.00	-5.60	1.00
49.70	38.50	1.00	27.30	11.20	1.00	24.60	13.70	1.00
37.40	0.00	1.00	23.10	-.20	1.00	49.90	5.30	1.00
51.70	1.00	1.00	[illegible]	3.70	1.00	33.70	1.20	1.00
33.40	14.20	1.00	29.40	[illegible]	1.00	62.70	-10.00	1.00
31.80	5.10	1.00	60.50	-2.30	1.00	35.00	6.90	1.00
55.10	1.30	1.00	[illegible]	1.20	1.00	27.70	2.10	1.00
35.70	.80	1.00	55.10	-1.40	1.00	48.20	17.50	1.00
37.30	5.00	1.00	33.00	10.10	1.00	30.90	11.50	1.00
34.40	5.60	1.00	30.70	15.50	1.00	39.20	6.40	1.00
54.30	-.30	1.00	39.80	21.00	1.00	35.30	14.90	1.00
31.30	17.40	1.00	41.70	2.30	1.00	20.20	.20	1.00
61.80	-10.00	1.00	24.60	6.10	1.00	49.10	-1.00	1.00
37.20	20.90	1.00	37.40	8.90	1.00	39.90	7.00	1.00
[illegible]	-4.30	1.00	[illegible]	8.70	1.00	37.40	6.50	1.00
[illegible]	.50	1.00	45.40	-.30	1.00	37.30	1.10	1.00
56.50	-.70	1.00	43.70	3.10	1.00	24.90	14.10	1.00
46.60	1.20	1.00	[illegible]	21.60	1.00	[illegible]	14.00	1.00
[illegible]	1.90	1.00	[illegible]	[illegible]	1.00	40.50	-.10	1.00
45.40	7.40	1.00	57.20	[illegible]	1.00	47.20	34.90	1.00
28.90	4.50	1.00	21.10	10.40	1.00	50.40	2.00	1.00
46.60	34.70	1.00	14.90	3.70	1.00	38.90	4.50	1.00
70.50	-10.00	1.00	49.60	[illegible]	1.00	65.30	0.00	1.00
46.10	1.90	1.00	35.30	3.60	1.00	17.40	5.30	1.00
43.60	7.40	1.00	35.30	[illegible]	1.00	30.00	13.40	1.00
41.60	12.20	1.00	31.50	[illegible]	1.00	33.70	7.90	1.00
57.80	-.20	1.00	44.10	17.20	1.00	44.20	5.70	1.00

43.00	30.50	1.00	53.10	2.80	1.00	27.20	19.50	1.00
23.10	6.80	1.00	37.60	12.50	1.00	44.10	2.30	1.00
34.20	9.20	1.00	56.20	-.90	1.00	30.40	11.50	1.00
32.60	10.00	1.00	61.30	-10.[illegible]	1.00	43.20	7.40	1.00
21.50	9.70	1.00	40.30	10.20	1.00	56.80	5.30	1.00
39.00	25.50	1.00	59.40	.10	1.00	24.30	4.90	1.00
23.60	8.40	1.00	21.40	7.70	1.00	21.60	9.60	1.00
30.90	-1.30	1.00	32.[illegible]	-2.80	1.00	26.70	5.70	1.00
43.40	0.00	1.00	31.50	2.50	1.00	29.20	4.10	1.00
36.00	.10	1.00	33.00	18.[illegible]	1.00	17.40	3.30	1.00
54.90	.90	1.00	27.10	5.50	1.00	57.70	4.10	1.00
40.70	26.20	1.00	46.40	13.10	1.00	69.00	.30	1.00
30.80	15.60	1.00	35.90	.50	1.00	69.20	-10.00	1.00
55.80	43.10	1.00	25.80	14.20	1.00	27.70	5.10	1.00
51.20	-.30	1.00	47.90	30.[illegible]	1.00	36.60	14.70	1.00
47.70	27.30	1.00	59.20	4.10	1.00	35.40	11.20	1.00
54.70	-10.00	1.00	[illegible]	.80	1.00	31.70	20.50	1.00
39.80	12.10	1.00	53.20	1[illegible].20	1.00	52.10	16.90	1.00
55.10	3.10	1.00	37.30	4.90	1.00	21.30	.60	1.00
17.40	7.20	1.00	29.30	11.50	1.00	31.30	-7.10	1.00
68.50	-10.00	1.00	57.40	45.60	1.00	34.80	2.60	1.00
34.00	18.30	1.00	43.20	1.60	1.00	41.20	22.40	1.00
26.40	9.40	1.00	41.80	2.[illegible]	1.00	37.70	9.30	1.00
22.00	11.90	1.00	46.[illegible]	1.40	1.00	39.[illegible]	24.30	1.00
42.10	18.20	1.00	17.30	4.[illegible]	1.00	20.60	3.90	1.00
25.30	7.50	1.00	62.[illegible]	[illegible]	1.00	46.60	20.90	1.00
41.10	-1.70	1.00	49.40	-10.[illegible]	1.00	23.90	2.00	1.00
19.90	5.50	1.00	22.[illegible]	1.10	1.00	22.40	2.50	1.00
18.30	7.20	1.00	37.40	.70	1.00	27.80	8.30	1.00
45.50	0.00	1.00	22.[illegible]	5.60	1.00	34.40	5.30	1.00
19.20	6.80	1.00	27.70	1.[illegible]	1.00	23.10	5.10	1.00
25.40	9.30	1.00	20.10	9.90	1.00	28.80	11.10	1.00
42.90	.20	1.00	23.[illegible]	8.50	1.00	32.70	12.80	1.00
4[illegible].60	1.30	1.00	37.50	14.40	1.00	60.10	-1.30	1.00
13.90	1.70	1.00	35.10	9.10	1.00	41.50	14.90	1.00
61.90	-10.00	1.00	39.[illegible]	23.40	1.00	44.10	15.30	1.00
44.50	5.50	1.00	43.70	26.30	1.00	35.50	9.00	1.00
27.60	7.50	1.00	45.50	-4.[illegible]	1.00	28.60	12.00	1.00
2[illegible]	4.50	1.00	2[illegible]	5.[illegible]	1.00	33.40	-.50	1.00
43.50	-4.[illegible]	1.00	41.[illegible]	22.50	1.00	39.10	4.30	1.00
34.70	9.40	1.00	3[illegible]	9.70	1.00	29.70	10.40	1.00
41.20	.20	1.00	22.70	9.[illegible]	1.00	25.10	1.70	1.00
5[illegible].30	-10.[illegible]	1.00	21.40	3.[illegible]	1.00	35.90	2.50	1.00
37.70	13.[illegible]	1.00	34.40	15.[illegible]	1.00	37.80	18.30	1.00
4[illegible].60	1.20	1.00	3[illegible]	14.1[illegible]	1.00	23.80	1.40	1.00
60.3[illegible]	-10.00	1.00	3[illegible]	[illegible]	1.00	28.40	11.70	1.00
71.60	-10.00	1.00	43.70	12.[illegible]	1.00	36.80	20.10	1.00
52.70	2.40	1.00	47.40	[illegible]	1.00	43.70	8.00	1.00
49.20	12.70	1.00	61.30	2.[illegible]	1.00	56.[illegible]	2.30	1.00
35.[illegible]	17.70	1.00	37.[illegible]	7.40	1.00	20.60	2.20	1.00
21.[illegible]	8.50	1.00	35.[illegible]	18.70	1.00	35.60	1.40	1.00
27.80	3.40	1.00	37.10	-.[illegible]	1.00	51.30	5.00	1.00

47.40	36.60	1.00	49.20	12.70	1.00	58.20	-10.00	1.00
43.60	19.50	1.00	39.50	19.80	1.00	45.40	14.40	1.00
46.10	.40	1.00	33.10	19.70	1.00	42.60	7.60	1.00
38.30	3.40	1.00	32.40	18.80	1.00	24.50	3.50	1.00
47.30	6.10	1.00	42.40	31.20	1.00	39.80	8.90	1.00
55.40	-.80	1.00	24.20	10.60	1.00	37.40	1.90	1.00
29.80	4.70	1.00	43.80	2.00	1.00	30.10	7.30	1.00
39.10	3.70	1.00	41.10	14.00	1.00	31.70	15.60	1.00
45.40	2.30	1.00	43.10	6.30	1.00	32.50	3.80	1.00
52.80	.30	1.00	24.90	11.40	1.00	30.00	7.80	1.00
49.70	3.50	1.00	58.30	2.90	1.00	45.50	8.90	1.00
32.10	14.60	1.00	71.40	-10.00	1.00	25.70	14.70	1.00
45.10	8.50	1.00	37.30	6.40	1.00	35.20	19.70	1.00
39.50	7.90	1.00	36.10	8.00	1.00	48.10	19.60	1.00
67.70	-10.00	1.00	25.20	5.60	1.00	25.30	6.70	1.00
37.10	3.10	1.00	31.40	10.40	1.00	24.40	7.90	1.00
25.10	4.90	1.00	32.70	3.70	1.00	66.10	1.90	1.00
37.40	11.00	1.00	29.60	11.70	1.00	23.50	4.30	1.00
21.90	6.30	1.00	42.70	2.70	1.00	58.50	-10.00	1.00
41.10	15.70	1.00	31.50	5.00	1.00	43.90	.60	1.00
17.80	6.70	1.00	19.30	4.10	1.00	46.60	3.60	1.00
30.50	6.30	1.00	36.50	8.50	1.00	33.60	10.30	1.00
53.10	-.70	1.00	26.70	3.90	1.00	33.80	10.60	1.00
39.90	10.40	1.00	34.10	12.40	1.00	46.50	15.60	1.00
32.00	17.20	1.00	45.70	8.30	1.00	47.40	1.90	1.00
40.30	5.30	1.00	32.60	20.50	1.00	29.60	10.00	1.00
34.50	7.00	1.00	33.00	11.10	1.00	35.00	17.70	1.00
49.90	9.10	1.00	33.30	12.00	1.00	53.50	.90	1.00
61.30	5.60	1.00	38.90	22.80	1.00	77.20	-10.00	1.00
65.20	9.30	1.00	24.50	10.00	1.00	67.60	1.10	1.00
56.90	-1.00	1.00	44.30	19.50	1.00	54.90	33.50	1.00
58.30	-1.20	1.00	40.50	5.00	1.00	45.00	.60	1.00
62.30	-10.00	1.00	24.40	10.80	1.00	51.50	4.00	1.00
26.00	12.60	1.00	38.60	23.00	1.00	40.80	23.30	1.00
45.40	10.00	1.00	29.10	8.30	1.00	52.00	3.50	1.00
44.00	6.40	1.00	32.00	8.00	1.00	42.40	1.40	1.00
39.10	22.70	1.00	40.50	13.70	1.00	27.90	16.20	1.00
28.30	.30	1.00	27.20	6.50	1.00	37.90	.30	1.00
31.80	5.40	1.00	33.90	2.00	1.00	36.50	15.60	1.00
42.60	3.10	1.00	44.10	.70	1.00	42.20	21.70	1.00
25.80	1.90	1.00	60.90	-10.00	1.00	45.50	33.60	1.00
26.00	9.00	1.00	25.30	8.90	1.00	48.40	.60	1.00
34.30	20.30	1.00	29.40	18.30	1.00	47.20	18.60	1.00
48.60	0.20	1.00	44.50	16.00	1.00	25.80	12.40	1.00
60.40	-1.40	1.00	34.60	17.50	1.00	31.80	2.10	1.00
37.00	-.20	1.00	41.70	-.40	1.00	27.70	10.80	1.00
17.60	6.60	1.00	35.00	24.10	1.00	36.00	1.30	1.00
33.00	1.10	1.00	23.30	11.00	1.00	23.90	9.50	1.00
32.70	8.10	1.00	38.50	12.40	1.00	40.30	5.90	1.00
33.20	6.40	1.00	66.40	-10.00	1.00	25.30	3.60	1.00
14.10	.20	1.00	23.40	11.40	1.00	25.70	.50	1.00
24.30	7.80	1.00	32.50	1.70	1.00	20.10	9.70	1.00

46.70	-.10	1.00	41.40	11.30	1.00	40.30	0.00	1.00
14.60	4.40	1.00	41.00	1.70	1.00	29.10	9.80	1.00
42.90	3.70	1.00	31.50	19.50	1.00	38.70	7.00	1.00
24.60	9.60	1.00	33.20	9.60	1.00	23.40	12.40	1.00
22.00	7.80	1.00	63.30	[illegible]	1.00	80.00	-14.70	1.00
48.20	21.20	1.00	41.00	11.50	1.00	53.50	29.80	1.00
71.70	3.90	1.00	49.30	36.50	1.00	52.60	36.80	1.00
25.20	1.50	1.00	44.40	[illegible]	1.00	67.30	1.20	1.00
45.60	25.00	1.00	33.50	28.40	1.00	26.40	4.90	1.00
17.40	3.20	1.00	20.40	2.10	1.00	41.60	1.10	1.00
29.00	7.80	1.00	32.50	2.70	1.00	28.80	10.30	1.00
38.70	1.40	1.00	33.50	15.30	1.00	56.20	-.30	1.00
33.00	1.70	1.00	49.60	.70	1.00	41.40	12.90	1.00
21.20	6.60	1.00	23.60	1.90	1.00	51.80	-.10	1.00
19.00	3.40	1.00	20.20	4.60	1.00	37.70	5.90	1.00
24.20	8.50	1.00	54.40	7.60	1.00	23.20	11.60	1.00
60.60	-10.00	1.00	21.50	9.20	1.00	24.50	11.60	1.00
39.20	5.70	1.00	36.50	1.10	1.00	24.10	1.70	1.00
24.10	2.40	1.00	16.20	3.20	1.00	29.30	.40	1.00
51.50	0.00	1.00	33.30	10.30	1.00	17.90	5.90	1.00
26.50	15.10	1.00	37.50	17.90	1.00	48.50	3.80	1.00
20.60	5.40	1.00	26.10	7.30	1.00	33.30	4.40	1.00
29.80	17.00	1.00	20.60	5.70	1.00	36.60	4.40	1.00
51.30	5.20	1.00	[illegible]	[illegible]	1.00	37.50	8.30	1.00
25.50	10.90	1.00	45.50	-.10	1.00	25.40	13.90	1.00
37.10	0.00	1.00	23.70	12.30	1.00	41.80	11.00	1.00
63.80	-10.00	1.00	48.70	2.30	1.00	40.10	14.30	1.00
47.60	7.00	1.00	[illegible]	[illegible]	1.00	29.10	15.70	1.00
[illegible]	21.50	1.00	41.20	[illegible]	1.00	39.30	28.40	1.00
[illegible]	7.10	1.00	33.30	1.70	1.00	24.70	14.50	1.00
25.30	14.40	1.00	39.60	-4.40	1.00	35.10	-.10	1.00
35.80	-.90	1.00	[illegible]	[illegible]	1.00	53.20	-10.00	1.00
44.60	8.50	1.00	47.20	.30	1.00	25.90	1.20	1.00
44.60	2.10	1.00	35.20	16.50	1.00	34.60	7.40	1.00
46.80	.90	1.00	20.60	5.70	1.00	42.40	.90	1.00
[illegible]	6.40	1.00	32.80	1.80	1.00	17.90	3.80	1.00
51.30	-.50	1.00	29.70	[illegible]	1.00	12.60	.70	1.00
19.00	7.70	1.00	37.10	1.50	1.00	19.00	7.70	1.00
21.40	2.10	1.00	57.50	[illegible]	1.00	22.30	6.30	1.00
38.20	6.30	1.00	31.10	[illegible]	1.00	35.20	3.60	1.00
26.50	6.80	1.00	47.40	[illegible]	1.00	22.50	5.80	1.00
26.90	3.80	1.00	22.40	8.70	1.00	28.30	9.70	1.00
44.80	.60	1.00	39.70	[illegible]	1.00			

```
MEAN SIGMA SIGMA1= 10.692 (KSI) -- PRESCRIBED

NO. OF DIFFERENT CI VALUES  -----  NCASE=        8
NO. OF CYCLES PER FLIGHT  -------  N1FLT=    19.0 (CYC)
NO. OF FLIGHTS IN UNITBLOCK  ----  NUNIT=     150 (F)
NO. OF CYCLES IN UNITBLOCK  -----      L= 2849.0 (CYC)
NO. OF STEPS IN UNITBLOCK  ------     NS=   2849
NO. OF UNITBLOCKS APPLIED
  TO ESTIMATE C, LAMBDA, ETC. --- NFLIGT=       1 (F)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     CI =    .10000E+00 (INCH)
LAST CRACK LENGTH     CLAST =    .10190E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     CI =    .20000E+00 (INCH)
LAST CRACK LENGTH     CLAST =    .20751E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     CI =    .30000E+00 (INCH)
LAST CRACK LENGTH     CLAST =    .31691E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     CI =    .40000E+00 (INCH)
LAST CRACK LENGTH     CLAST =    .43054E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     CI =    .50000E+00 (INCH)
LAST CRACK LENGTH     CLAST =    .5497 E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     CI =    .70000E+00 (INCH)
LAST CRACK LENGTH     CLAST =    .8093 E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     CI =    .90000E+00 (INCH)
LAST CRACK LENGTH     CLAST =    .1114 E+01 (INCH)

NUMBER OF FLIGHT NUMFLT=    .127782E+03
INITIAL CRACK LENGTH     CI =    .11000E+01 (INCH)
LAST CRACK LENGTH     CLAST =    .14433E+01 (INCH)
```

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**************************************************************
F-B-? AIR-TO-GROUND SPECTRUM
**************************************************************

COMPUTED PER FLIGHT
ESTIMATION OF PARAMETERS C, LAMEDA AND PRODUCT

ORIGINAL   8  DATA
I= 1   DCDF=  .13092E-04   KBAR=  .6[illegible]705E+01 --- FOR C0=  .1000
I= 2   DCDF=  .50076E-04   KBAR=  .[illegible]739E+01 --- FOR C0=  .2000
I= 3   DCDF=  .11270E-03   KBAR=  .10767E+02 --- FOR C0=  .3000
I= 4   DCDF=  .22359E-03   KBAR=  .12622E+02 --- FOR C0=  .4000
I= 5   DCDF=  .33150E-03   KBAR=  .14376E+02 --- FOR C0=  .5000
I= 6   DCDF=  .72922E-03   KBAR=  .17683E+02 --- FOR C0=  .7000
I= 7   DCDF=  .14295E-02   KBAR=  .21923E+02 --- FOR C0=  .9000
I= 8   DCDF=  .26869E-02   KBAR=  .26733E+02 --- FOR C0= 1.1000

MODIFIED DATA EXCEPT ZERO VALUES
  FOR ALL KBAR-VALUES   --   J=  8
 I       DCDF           KBAR
 1    .13092E-04    .6[illegible]5E+ 1
 2    .50076E-04    .[illegible]67[illegible]9E+ 1
 3    .11270E-03    .10767E+ 2
 4    .22359E-03    .12622E+ 2
 5    .33150E-03    .14376E+ 2
 6    .72922E-03    .17683E+ 2
 7    .14295E-02    .21923E+ 2
 8    .26869E-02    .26733E+ 2

CALCULATED RESULTS
  FOR ALL KBAR-VALUES
     POWER =   .2[illegible]E+01
     SIGMA =   .1[illegible]92E+02
     LAMEDA=   .3[illegible]11[illegible]E+01
     LOG(C)=  -.7[illegible]31E+01
     C     =   .2[illegible]4[illegible]E-0[illegible]
     PRODCT=   .10[illegible]E-03
```

CRACK GROWTH ANALYSIS WILL BE PERFORMED USING THE COMPUTED FLTGRO GROWTH RATE COEFFICIENTS

CONTROL POINT A-G BASE

CRACK GROWTH RATE EQUATION FOR CALCULATING LIFE

DA/DF = C * (KBAR)**LAMBDA

INITIAL CRACK LENGTH = .14[illegible]
INITIAL CRACK DEPTH = 0.0[illegible]

NUMBER OF TIMES TO APPLY MISSION SEQUENCE = 1[illegible]000

SEGMENT	NO. OF OCCURRENCES	COEFF. C	EXPN. LAMBDA	DELTA SIGMA	STRESS RATIO	SIGMA MAX
1 A-G	1	2.[illegible]648E-08	3.612	10.692	.318	24.000

F-5-2 AIR-TO GROUND SPECTRUM, FOR CENTERED THRU CRACK

CONTROL POINT A-G BASE

CRACK GROWTH SUMMARY TABLE FOR EVERY 37 FLIGHTS

INITIAL CRACK = .1450

RETARDATION IS CONSIDERED IN THIS ANALYSIS

37	.1460	.1470	.1480	.1490	.1500	.1511	.1521	.1532	.1543	.1554
407	.1565	.1576	.1588	.1599	.1611	.1623	.1635	.1647	.1660	.1672
777	.1685	.1698	.1711	.1724	.1738	.1751	.1765	.1779	.1793	.1808
1147	.1823	.1837	.1853	.1868	.1883	.1899	.1915	.1932	.1948	.1965
1517	.1982	.2000	.2017	.2035	.2053	.2072	.2091	.2110	.2129	.2149
1887	.2169	.2190	.2211	.2232	.2253	.2275	.2298	.2321	.2344	.2367
2257	.2391	.2416	.2441	.2466	.2492	.2519	.2546	.2573	.2601	.2630
2627	.2659	.2689	.2719	.2751	.2782	.2815	.2848	.2882	.2916	.2952
2997	.2988	.3025	.3063	.3101	.3141	.3182	.3223	.3266	.3310	.3354
3367	.3400	.3448	.3496	.3545	.3596	.3649	.3703	.3758	.3815	.3873
3737	.3933	.3995	.4059	.4125	.4193	.4263	.4335	.4410	.4487	.4566
4107	.4649	.4734	.4823	.4914	.5009	.5108	.5213	.5317	.5428	.5543
4477	.5663	.5799	.5920	.6057	.6201	.6352	.6510	.6676	.6851	.7036
4847	.7232	.7439	.7659	.7893	.8142	.8410	.8697	.9007	.9342	.9707
5217	1.0108	1.0549	1.1054	1.1592	1.2221	1.2950	1.3816			

FINAL CRACK = 1.4444 OCCURRED IN FLIGHT 5462

F-E-2 AIR-TO GROUND SPECTRUM. FOR CENTERED THRU CRACK

* * * P L O T S U M M A R Y * * *

END DISSPLA -- 0 VECTORS GENERATED IN 0 PLOT FRAMES.

*** NORMAL END FOR FLTGRO ***

The second example is to predict the crack-growth behavior of the identical crack configuration under the identical spectrum loading as that was described in the first example, by the multi-segment per-flight method (Method II). The crack growth rate constants and parameters used in the second example are identical to those used in the first example. Each flight of the A-G spectrum was arbitrarily divided into three segments, the first segment, (A-G), consisting 5 cycles, the second segment, $(A\text{-}G)_2$ consisting 7 cycles, and $(A\text{-}G)_3$ also consisting of 7 cycles.

Again, eight (8) initial crack sizes were selected for the characterization of each flight segment. The initial crack sizes selected for this example were identical to those in the first example. The calculated C.λ and σ for each flight segment are:

$(A\text{-}G)_1$: $C = 4.072 \times 10^{-9}$, $\lambda = 3.7664$, $\sigma = 10.692$ Ksi

$(A\text{-}G)_2$: $C = 5.2411 \times 10^{-9}$, $\lambda = 3.7592$, $\sigma = 10.692$ Ksi

$(A\text{-}G)_3$ $C = 6.5638 \times 10^{-9}$, $\lambda = 3.7634$, $\sigma = 10.692$ Ksi

These parameters were then used in the prediction of the crack growth of a CCT specimen with an initial size C = 0.145 in. The crack growth results are shown in the summary table of the computer outputs. It shows the predicted life by Method II is Np = 6246 flights. A CRT plot of the crack growth curve is shown in the printout.

```
FLTOF      NONE
COMPUTE C AND LAMBDA
A-G BASE
F-B-2   AIR-TO GROUND SPECTRUM.   FOR CENTERED THRU CRACK
2219-T851 ALUMINUM                          43.         45.        60.
 2.          3.
 .75  -0.99  0.6   1.0   5.366   -1.  3.83  0.    1.5
                                      0.145       .25        6.0
2010       1
   8
0.10 0.20 0.30 0.40 0.50 0.70 0.90 1.10
   1    2    3
A-G1       5 A-G2      12 A-G3      19
F-B-2   AIR-TO-GROUND SPECTRUM
 24.             1  1.25
    1 2851   150         -1   -1    1   15    1
GROW CRACK
   0.      10000        1       0       0       0       1     150
     150    1
PLOT
   0        0      0
END
```

```
FLIGHT BY FLIGHT CRACK GROWTH ANALYSIS     F L T C R G

F-B-2   AIR-TO GROUND SPECTRUM,   FOR CENTERED THRU CRACK
2219-T851 ALUMINUM

CRACK GROWTH RATE EQUATION FOR CALCULATING C, LAMBDA, AND SIGMA
      DA/N = CWALK * (DELTA K/(1-R)**(1-M))**N

ANALYSIS FOR THIS RUN IS DONE BY THE MULTIPLE FLIGHT SEGMENT METHOD
INPUT MATERIAL CONSTANTS AND CONTROL PARAMETERS

YIELD STRESS ----- SIGMAY=    48.00 (KSI)
KIC FOR A    ----- AKIC  =    45.00 (KSI*SQRT(INCH))
KIC FOR C    ----- CKIC  =    6[illegible].00 (KSI*SQRT(INCH))

POWER             -----      =   .20000E+01
WALKER"S COEFF    -----   C  =   .5 660E-[illegible]
EXP SMALL N    -------    N  =   .38300E+01
EXP SMALL M    -------    M  =   .60000E+00
EXP SMALL G    -------    G  =   1.000
+R CUTOFF       ----- RCUT+  =    .750
-R CUTOFF       ----- RCUT-  =   -.990

THRESHOLD=    1.5* (1.-[illegible]*ABS(R))
INIT. HALF CRACK SIZE   C0 = SPECIFIED LATER.
INITIAL CRACK DEPTH     A0 =    .            (INCH)
ASPECT RATIO    ---- A0/2C0 =   .
PHI SQUARED     ----------  =   .
EQUIVALENT THICKNESS - T    =   .25000E+00 (INCH)
HALF WIDTH      ------ W/2  =   .3[illegible]E+01 (INCH)

TYPE         = 2     (PART THROUGH CRACK=1,  THROUGH CRACK=2)
CRACK CODE= 2[illegible]1[illegible]      THROUGH CRACK, CENTERED
RETARD       = 1     (NO LOAD INTERACTION=[illegible], WITH LOAD INTERACTION=1)
RETARDATION SHUT-OFF RATIO FOR CRACK ARREST=  3.0
```

```
****************************************************************
F-B-2   AIR-TO-GROUND SPECTRUM
****************************************************************
DESIGN LIMIT STRESS=  .2400E+02 (KSI)
SPECTRUM HAS BEEN RANGED PAIRED

MEAN SIGMA SIGMA1= 1 .692 (KSI) -- PRESCRIBED

NO. OF DIFFERENT C0 VALUES  ------  NCASE=          8
NO. OF CYCLES PER FLIGHT  --------  NIFLT=       19.0 (CYC)
NO. OF FLIGHTS IN UNITBLOCK  ----   NUNIT=        150 (F)
NO. OF CYCLES IN UNITBLOCK  -----       L=     2849.0 (CYC)
NO. OF STEPS IN UNITBLOCK  ------      NS=     2849
NO. OF UNITBLOCKS APPLIED
   TO ESTIMATE C, LAMBDA, ETC. --- NFLIGT=          1 (F)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     C  =    .1000  E+00 (INCH)
LAST CRACK LENGTH    CLAST  =    .10057E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+ 3
INITIAL CRACK LENGTH     C  =    .2000 E+00 (INCH)
LAST CRACK LENGTH    CLAST  =    .2019 E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+ 3
INITIAL CRACK LENGTH     C  =    .3000 E+00 (INCH)
LAST CRACK LENGTH    CLAST  =    .3043 E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+ 3
INITIAL CRACK LENGTH     C  =    .4000 E+00 (INCH)
LAST CRACK LENGTH    CLAST  =    .40777E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+ 3
INITIAL CRACK LENGTH     C  =    .5000 E+00 (INCH)
LAST CRACK LENGTH    CLAST  =    .5122 E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+ 3
INITIAL CRACK LENGTH     C  =    .7000 E+00 (INCH)
LAST CRACK LENGTH    CLAST  =    .7252 E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+ 3
INITIAL CRACK LENGTH     C  =    .9000 E+00 (INCH)
LAST CRACK LENGTH    CLAST  =    .9456 E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+ 3
INITIAL CRACK LENGTH     C  =    .1100 E+01 (INCH)
LAST CRACK LENGTH    CLAST  =    .1178 E+01 (INCH)
```

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***********************************************************
F-B-? AIR-TO-GROUND SPECTRUM
***********************************************************

COMPUTED PER FLIGHT
ESTIMATION OF PARAMETERS C, LAMBDA AND PRODUCT

ORIGINAL    8  DATA
I= 1   DCDF=  .35031E-05   KBAR=  .6 274E+01 --- FOR CO=  .1000
I= 2   DCDF=  .13290E-04   KBAR=  .8 612E+01 --- FOR CO=  .2000
I= 3   DCDF=  .29083E-04   KBAR=  .1 546E+02 --- FOR CO=  .3000
I= 4   DCDF=  .51785E-04   KBAR=  .12267E+02 --- FOR CO=  .4000
I= 5   DCDF=  .81666E-04   KBAR=  .13840E+02 --- FOR CO=  .5000
I= 6   DCDF=  .16844E-03   KBAR=  .16773E+02 --- FOR CO=  .7000
I= 7   DCDF=  .30435E-03   KBAR=  .19670E+02 --- FOR CO=  .9000
I= 8   DCDF=  .51979E-03   KBAR=  .22799E+02 --- FOR CO= 1.1000

MODIFIED DATA EXCEPT ZERO VALUES
  FOR ALL KBAR-VALUES  --  N=  8
 I        DCDF            KBAR
 1     .35031E-05      .62274E+01
 2     .13290E-04      .86612E+01
 3     .29083E-04      .10546E+02
 4     .51785E-04      .12267E+02
 5     .81666E-04      .13840E+02
 6     .16844E-03      .16773E+02
 7     .30435E-03      .19670E+02
 8     .51979E-03      .22799E+02

CALCULATED RESULTS
  FOR ALL KBAR-VALUES
    POWER  =   .2????E+01
    SIGMA  =   .1?692E+02
    LAMBDA=    .37664E+01
    LOG(C)=   -.83902E+01
    C      =   .43722E-0?
    PRODCT=    .3?589E-04

NUMBER OF FLIGHT NUMFLT=   .1500??E+ 5
INITIAL CRACK LENGTH    C   =   .1000 E+00 (INCH)
LAST CRACK LENGTH     CLAST =   .1??6??+00 (INCH)

NUMBER OF FLIGHT NUMFLT=   .150???E+ 7
INITIAL CRACK LENGTH    C   =   .200? ?+00 (INCH)
LAST CRACK LENGTH     CLAST =   .2025??+00 (INCH)
```

```
NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     C0 =    .30000E+00 (INCH)
LAST CRACK LENGTH     CLAST =    .30557E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     C0 =    .40000E+00 (INCH)
LAST CRACK LENGTH     CLAST =    .40988E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     C0 =    .50000E+00 (INCH)
LAST CRACK LENGTH     CLAST =    .51560E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     C0 =    .70000E+00 (INCH)
LAST CRACK LENGTH     CLAST =    .73235E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     C0 =    .90000E+00 (INCH)
LAST CRACK LENGTH     CLAST =    .96000E+00 (INCH)

NUMBER OF FLIGHT NUMFLT=    .150000E+03
INITIAL CRACK LENGTH     C0 =    .11000E+01 (INCH)
LAST CRACK LENGTH     CLAST =    .12040E+01 (INCH)
```

```
*************************************************************************
F-B-2   AIR-TO-GROUND SPECTRUM
*************************************************************************

COMPUTED PER FLIGHT
ESTIMATION OF PARAMETERS C, LAMEDA AND PRODUCT

ORIGINAL     DATA
I= 1   DCDF=  .44748E-05   KBAR=  .6[illegible]18E+01 --- FOR C0=  .1000
I= 2   DCDF=  .16836E-04   KBAR=  .8[illegible]728E+01 --- FOR C0=  .2000
I= 3   DCDF=  .37110E-04   KBAR=  .1[illegible]67E+02 --- FOR C0=  .3000
I= 4   DCDF=  .65862E-04   KBAR=  .12[illegible]0E+02 --- FOR C0=  .4000
I= 5   DCDF=  .10410E-03   KBAR=  .1[illegible]89E+02 --- FOR C0=  .5000
I= 6   DCDF=  .21564E-03   KBAR=  .1[illegible]67E+02 --- FOR C0=  .7000
I= 7   DCDF=  .40042E-03   KBAR=  .19859E+02 --- FOR C0=  .9000
I= 8   DCDF=  .69649E-03   KBAR=  .23168E+02 --- FOR C0= 1.1000

MODIFIED DATA EXCEPT ZERO VALUES
 FOR ALL KBAR-VALUES  --  N=  8
 I        DCDF            KBAR
 1     .44748E-05      .6[illegible]18E+01
 2     .16836E-04      .8[illegible]28E+01
 3     .37110E-04      .1[illegible]67E+02
 4     .65862E-04      .12[illegible]0E+02
 5     .10410E-03      .13[illegible]89E+02
 6     .21564E-03      .16[illegible]67E+02
 7     .40042E-03      .19859E+02
 8     .69649E-03      .23168E+02

CALCULATED RESULTS
 FOR ALL KBAR-VALUES
   POWER  =   .2[illegible]E+01
   SIGMA  =   .10[illegible]2E+02
   LAMBDA =   .375[illegible]2E+01
   LOG(C) =  -.828[illegible]6E+01
   C      =   .52411E-08
   PRODCT =   .387[illegible]8E-04

NUMBER OF FLIGHT NUMFLT=    .[illegible]E+ [illegible]
INITIAL CRACK LENGTH     C   =   .10[illegible]E+[illegible] (INCH)
LAST CRACK LENGTH     CLAST  =   .10[illegible]E+[illegible] (INCH)

NUMBER OF FLIGHT NUMFLT=    .1[illegible]E+ [illegible]
INITIAL CRACK LENGTH     C   =   .2[illegible]E+[illegible] (INCH)
LAST CRACK LENGTH     CLAST  =   .2032[illegible]E+[illegible] (INCH)
```

```
NUMBER OF FLIGHT NUMFLT=     .150000E+ 3
INITIAL CRACK LENGTH      C   =    .30000E+00  (INCH)
LAST CRACK LENGTH     CLAST   =    .33711E+00  (INCH)

NUMBER OF FLIGHT NUMFLT=     .150000E+ 3
INITIAL CRACK LENGTH      C   =    .40000E+00  (INCH)
LAST CRACK LENGTH     CLAST   =    .41266E+00  (INCH)

NUMBER OF FLIGHT NUMFLT=     .150000E+ 3
INITIAL CRACK LENGTH      C   =    .52000E+00  (INCH)
LAST CRACK LENGTH     CLAST   =    .52210E+00  (INCH)

NUMBER OF FLIGHT NUMFLT=     .150000E+ 3
INITIAL CRACK LENGTH      C   =    .70000E+00  (INCH)
LAST CRACK LENGTH     CLAST   =    .74240E+00  (INCH)

NUMBER OF FLIGHT NUMFLT=     .150000E+ 3
INITIAL CRACK LENGTH      C   =    .90000E+00  (INCH)
LAST CRACK LENGTH     CLAST   =    .97830E+00  (INCH)

NUMBER OF FLIGHT NUMFLT=     .150000E+ 3
INITIAL CRACK LENGTH      C   =    .11000E+01  (INCH)
LAST CRACK LENGTH     CLAST   =    .12372E+01  (INCH)
```

```
**********************************************************************
F-B-2  AIR-TO-GROUND SPECTRUM
**********************************************************************

COMPUTED PER FLIGHT
ESTIMATION OF PARAMETERS C, LAMBDA AND PRODUCT

ORIGINAL      DATA
I= 1    DCDF= .55605E-05    KBAR= .60338E+01 --- FOR C0=  .1000
I= 2    DCDF= .21377E-04    KBAR= .85796E+01 --- FOR C0=  .2000
I= 3    DCDF= .47388E-04    KBAR= .10580E+02 --- FOR C0=  .3000
I= 4    DCDF= .84512E-04    KBAR= .12321E+02 --- FOR C0=  .4000
I= 5    DCDF= .13438E-03    KBAR= .13920E+02 --- FOR C0=  .5000
I= 6    DCDF= .28309E-03    KBAR= .16936E+02 --- FOR C0=  .7000
I= 7    DCDF= .52011E-03    KBAR= .19974E+02 --- FOR C0=  .9000
I= 8    DCDF= .91461E-03    KBAR= .23561E+02 --- FOR C0= 1.1000

MODIFIED DATA EXCEPT ZERO VALUES
  FOR ALL KBAR-VALUES   --   N=  8
I        DCDF             KBAR
1     .55605E-05       .60338E+01
2     .21377E-04       .85796E+01
3     .47388E-04       .10580E+02
4     .84512E-04       .12321E+02
5     .13438E-03       .13920E+02
6     .28309E-03       .16936E+02
7     .52011E-03       .19974E+02
8     .91461E-03       .23561E+02

CALCULATED RESULTS
  FOR ALL KBAR-VALUES
     POWER  =   .2[illegible]E+01
     SIGMA  =   .13692E+02
     LAMBDA=    .37634E+01
     LOG(C)=   -.81828E+01
     C      =   .656[illegible]E-0[illegible]
     PRODCT=    .48967E-04
```

CRACK GROWTH ANALYSIS WILL BE PERFORMED USING THE COMPUTED FLTCRO GROWTH RATE COEFFICIENTS

CONTROL POINT A-G BASE

CRACK GROWTH RATE EQUATION FOR CALCULATING LIFE

DA/DN = C*WALK * (DELTA K/(1-R)**(1-M))**N

INITIAL CRACK LENGTH = .143[illegible]
INITIAL CRACK DEPTH = [illegible].00[illegible]

NUMBER OF TIMES TO APPLY MISSION SEQUENCE = 1[illegible]0

MISSION	NO. OF OCCURRENCES	COEFF. C	EXPN. N	MAX STRESS	MIN STRESS	CYCLES
1 A-G1	150	8.1440E-10	3.766	12.	4.	5.
1 A-G2	150	7.4873E-10	3.759	12.	3.	7.
1 A-G3	150	9.[illegible]7[illegible]9E-10	3.763	12.	3.	7.

F-R-2 AIR-TO GROUND SPECTRUM, E.H. CENTERED THRU CRACK

CONTROL POINT A-A BASE

CRACK GROWTH SUMMARY TABLE FOR EVERY 150 FLIGHTS

INITIAL CRACK = .145

RETARDATION IS CONSIDERED IN THIS ANALYSIS

150	.1483	.1515	.1554	.1592	.1632	.1674	.1718	.1764	.1812	.1863
1650	.1917	.1974	.2034	.2098	.2166	.2238	.2315	.2396	.2484	.2578
3150	.2679	.2788	.2906	.3033	.3172	.3324	.3490	.3674	.3877	.4103
4650	.4358	.4645	.4973	.5350	.5791	.6315	.6947	.7733	.8747	1.0133
6150	1.2232									

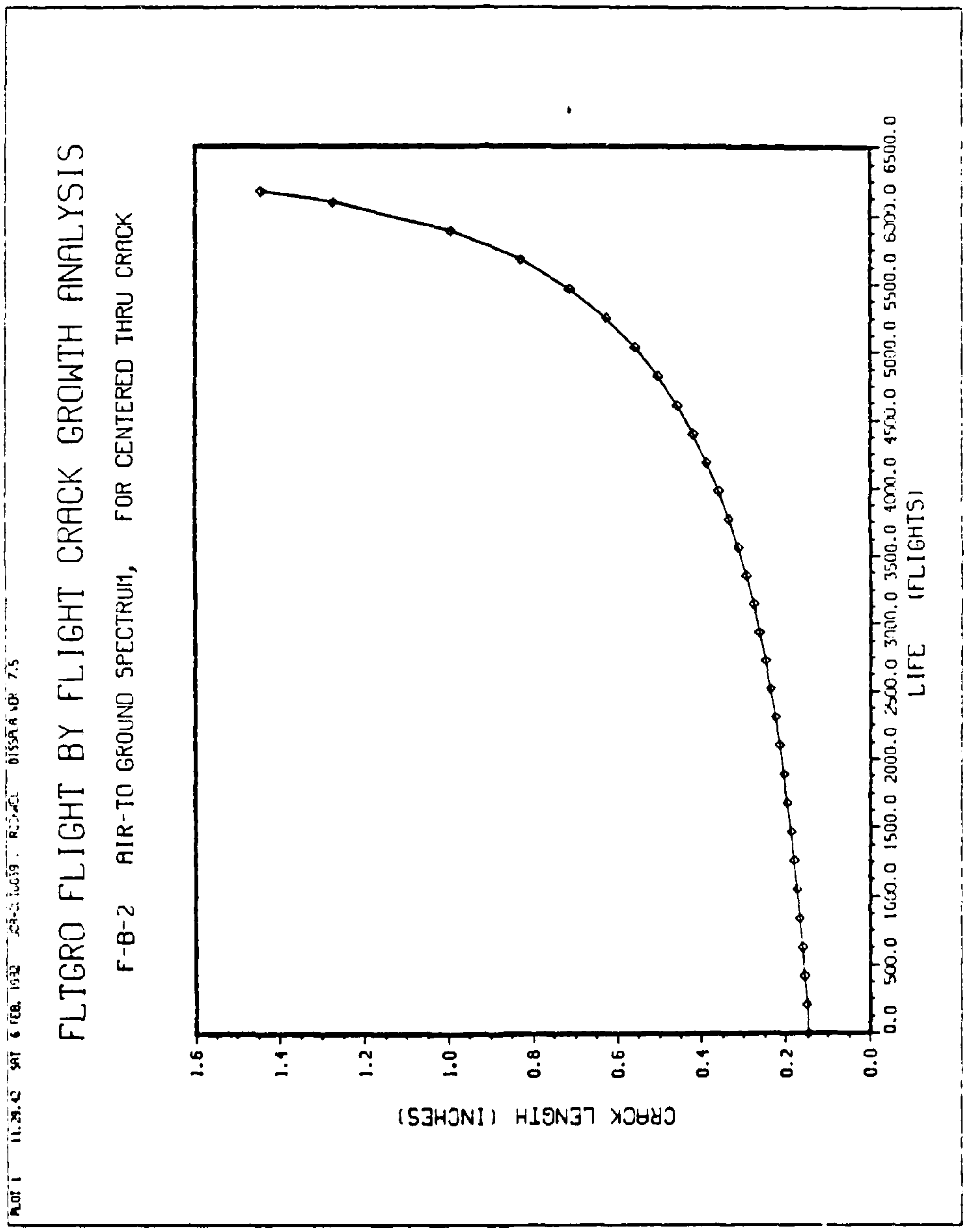
FINAL CRACK = 1.4434 OCCURRED IN FLIGHT 6246

```
F-E-2   AIR-TO GROUND SPECTRUM,   FOR CENTERED THRU CRACK

* * *  P L O T   S U M M A R Y  * * *

END DISSPLA --        0 VECTORS GENERATED IN     0 PLOT FRAMES.

***  NORMAL END FOR FLTGRO  ***
```


FLTGRO FLIGHT BY FLIGHT CRACK GROWTH ANALYSIS
F-B-2 AIR-TO GROUND SPECTRUM, FOR CENTERED THRU CRACK
CRACK LENGTH (INCHES)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
LIFE (FLIGHTS)
0.0
500.0
1000.0
1500.0
2000.0
2500.0
3000.0
3500.0
4000.0
4500.0
5000.0
5500.0
6000.0
6500.0

Appendix

A TYPICAL FIGHTER AIR-TO-GROUND
BASELINE MISSION SPECTRUM TABLE

1	-10.0*	50.1	29.6	41.9	4.2	20.1	7.8	48.9	6.3	37.1
2	8.4	37.8	16.4	28.6	17.8	49.5	13.8	26.9	4.0	42.9
3	11.4	74.1	20.3	34.5	1.5	21.0	7.8	39.5	11.9	23.8
4	2.1	71.5	11.3	43.6	6.5	33.1	10.9	56.3	-10.0	51.4
5	.6	18.9	7.0	55.9	31.7	48.6	3.0	17.3	6.9	44.1
6	30.6	42.4	25.3	44.3	2.9	31.2	4.9	28.6	3.6	29.7
7	18.0	28.4	14.4	44.2	16.4	35.2	8.0	51.8	8.1	23.3
8	2.8	21.7	8.7	59.5	12.3	47.3	-10.0	67.1	42.2	57.2
9	14.5	35.4	11.8	27.8	5.5	19.6	3.7	27.7	8.3	31.1
10	.6	28.8	9.2	22.6	12.5	41.6	.5	26.4	15.3	39.3
11	-.1	19.5	5.1	28.7	5.7	31.4	4.3	22.3	10.7	24.5
12	1.6	12.0	0.0	48.2	-10.0	31.1	7.1	23.7	6.6	35.2
13	12.1	49.2	11.0	78.4	4.4	29.2	5.2	29.5	6.7	30.8
14	16.1	26.3	11.0	37.8	5.8	17.2	-1.2	23.6	3.2	42.5
15	22.8	40.3	6.5	33.6	8.5	49.9	21.0	43.2	22.5	45.2
16	13.1	33.6	-10.0	25.1	6.4	78.6	11.3	42.4	5.5	34.6
17	10.6	71.7	5.1	35.1	11.2	32.1	1.4	46.3	15.4	37.3
18	5.4	46.9	.1	24.1	6.5	40.8	21.2	42.7	9.4	23.3
19	3.8	28.4	5.1	48.1	36.2	38.5	4.4	40.0	3.8	28.0
20	-10.0	19.0	7.0	35.6	5.2	31.1	4.0	29.6	0.0	53.1
21	7.2	36.8	11.1	35.7	11.3	40.1	9.0	29.8	16.0	51.3
22	-5.6	25.4	14.3	36.9	6.5	30.1	17.0	38.5	14.5	32.3
23	6.9	38.1	8.6	35.2	0.0	37.7	18.1	37.0	-10.0	50.5
24	8.5	23.8	5.7	37.7	3.0	30.6	18.3	62.8	1.9	36.7
25	10.6	39.3	3.6	38.0	4.0	32.3	7.2	35.1	15.6	55.2
26	0.0	47.4	3.0	38.1	14.6	32.0	7.5	21.2	2.7	29.6
27	12.2	37.9	.3	33.8	15.3	45.0	-10.0	32.5	8.6	46.5
28	-.4	75.6	-.3	33.5	10.8	27.1	14.8	48.9	17.9	35.1
29	2.8	57.0	10.8	52.9	2.2	48.3	25.3	64.1	12.6	34.4
30	-14.7	53.9	17.3	62.1	27.3	39.1	8.7	38.5	6.5	45.3
31	23.4	47.8	10.3	33.6	-10.0	70.0	-.5	35.3	1.7	50.0
32	3.1	41.4	.8	25.8	13.9	30.7	15.9	53.5	1.3	38.9
33	.2	28.1	10.0	25.0	2.2	58.8	1.6	36.8	4.5	33.2
34	3.3	48.7	.3	26.9	2.5	18.9	2.5	58.5	17.3	27.6
35	4.5	33.0	-10.0	32.8	3.0	35.7	7.5	41.9	27.8	39.7
36	6.2	19.5	8.2	32.1	11.4	31.7	-.4	15.6	2.5	60.7
37	13.5	64.0	5.0	29.6	16.9	41.6	1.5	36.2	[illegible]	28.9
38	9.2	34.1	7.4	32.0	14.8	37.9	13.5	26.1	6.8	25.7
39	-10.0	46.1	22.5	38.5	3.2	33.0	13.9	25.3	15.3	30.8
40	2.5	69.4	5.2	34.4	17.5	30.2	19.0	35.3	16.1	45.6
41	11.8	36.5	11.8	35.7	12.0	24.8	5.8	21.[illegible]	7.0	54.[illegible]
42	11.8	42.4	1.5	59.3	24.6	47.9	6.2	25.6	-10.0	36.6
43	3.7	20.9	6.3	47.2	16.9	63.4	1.1	15.5	.8	48.6
44	3.6	68.2	.7	46.1	16.9	43.4	12.6	26.2	3.7	45.9
45	3.8	49.5	10.8	35.5	16.7	44.8	3.4	34.2	1.[illegible]	16.8
46	5.1	53.6	3.8	45.6	4.6	34.8	-10.0	63.2	8.6	19.7
47	6.2	33.9	2.9	44.9	19.5	40.1	-1.2	37.2	.8	40.0
48	22.3	58.4	23.3	46.6	1.7	54.0	3.0	28.2	11.0	38.3
49	-1.7	12.3	.8	33.7	2.4	30.6	5.0	27.0	.4	39.0
50	12.2	45.2	10.1	29.5	-10.0	38.9	16.8	31.7	6.0	18.9
51	6.5	19.8	0.0	53.7	.9	25.0	13.8	28.7	2.2	32.1
52	.1	49.5	-4.5	29.5	5.8	21.5	5.2	21.5	5.4	46.0
53	4.6	28.3	9.3	41.0	19.3	44.9	8.9	33.[illegible]	[illegible]	24.7
54	12.3	38.7	-10.0	29.5	15.8	35.7	1.2	27.9	8.6	59.4
55	21.5	31.8	7.7	46.9	14.3	46.1	3.4	32.2	.3	37.9
56	-.8	24.9	14.0	43.8	10.2	37.5	7.9	36.1	.9	67.2
57	13.9	51.4	4.0	25.9	15.2	54.6	7.7	54.2	.5	69.7
58	-10.0	68.4	2.5	35.4	13.6	42.3	15.1	27.0	6.1	30.1
59	11.9	33.9	7.6	58.4	7.3	24.5	11.9	39.9	8.4	54.6
60	25.4	74.1	-.8	60.3	21.8	44.7	7.8	43.6	3.5	34.1
61	20.4	60.9	6.0	34.3	19.3	41.3	27.0	37.7	-10.0	24.5
62	2.0	31.5	.2	57.5	9.4	41.5	7.9	46.4	5.1	19.0

*% of DLS

Fighter Air-To-Ground Mission

63	.4	37.8	27.0	40.1	6.0	21.9	6.4	22.4	11.2	34.7
64	9.3	42.2	8.2	40.7	17.5	46.7	.3	41.1	19.1	49.3
65	11.9	24.8	12.3	42.9	.7	23.8	-10.0	45.0	18.7	62.5
66	2.2	40.2	14.0	34.1	3.2	52.3	4.0	24.4	11.9	48.6
67	-3.8	34.7	23.2	38.9	9.5	25.3	10.1	25.0	7.4	21.2
68	-.1	31.6	.9	18.9	1.4	36.4	0.0	32.5	4.9	35.9
69	7.1	33.5	2.0	40.0	-10.0	28.4	13.1	36.3	10.8	55.1
70	34.6	49.6	1.9	28.3	7.3	35.7	8.3	50.6	17.3	57.1
71	8.3	54.5	14.2	36.6	14.2	39.5	21.6	41.5	10.5	48.9
72	9.5	41.6	19.7	47.7	11.3	59.6	6.1	51.4	10.7	28.5
73	3.7	57.1	-10.0	30.4	11.7	41.0	8.3	23.2	.7	24.9
74	-.1	49.3	8.4	24.5	.5	30.6	12.4	33.0	16.2	40.0
75	14.4	42.4	3.6	31.9	.1	49.5	2.2	29.4	.8	44.5
76	3.7	46.6	.2	58.4	9.1	44.5	5.4	25.6	10.5	31.7
77	-10.0	20.5	8.3	44.4	22.2	34.1	16.6	38.9	0.0	78.9
78	-.7	25.1	-2.0	63.6	3.5	62.1	15.4	27.9	12.2	31.0
79	18.7	40.8	21.9	41.0	11.2	28.5	12.7	23.6	12.2	35.6
80	2.9	49.9	5.3	46.9	5.4	29.2	7.8	35.1	-10.0	26.7
81	5.0	49.3	15.3	41.5	5.0	46.0	1.6	43.3	.5	45.7
82	5.0	47.8	12.0	26.2	-.4	18.9	-2.3	31.1	10.4	38.6
83	5.6	47.6	4.0	73.0	-1.7	35.5	.2	27.0	16.4	70.0
84	0.0	34.9	18.4	52.3	9.1	49.6	-10.0	40.3	6.4	30.4
85	12.5	47.7	6.0	27.2	4.3	17.7	4.2	19.6	4.2	22.5
86	-.1	51.6	5.3	19.1	-1.0	23.0	6.4	24.1	13.3	50.7
87	18.3	46.0	11.8	30.9	-1.5	37.6	7.4	52.7	2.9	34.1
88	21.3	36.1	13.5	35.7	-10.0	28.0	4.9	25.2	14.2	25.3
89	10.2	45.1	20.0	58.0	15.3	30.9	6.2	53.2	.5	33.2
90	12.5	38.3	-.9	35.1	4.8	62.4	-.8	26.0	11.3	47.7
91	29.8	41.6	0.0	60.3	.6	22.5	-1.8	31.9	14.7	44.9
92	.7	37.9	-10.0	24.8	2.3	29.9	5.1	46.6	.3	14.5
93	-1.5	16.9	2.0	45.5	30.0	50.8	-.5	17.8	5.4	39.6
94	22.9	67.9	9.6	25.2	6.9	36.2	8.0	27.6	9.5	47.3
95	11.3	27.7	.4	28.9	18.5	39.5	8.6	75.1	7.4	21.2
96	-10.0	69.0	8.1	35.0	14.4	52.9	.6	26.2	4.1	28.0
97	14.2	53.4	10.1	35.6	4.3	38.1	-.9	56.0	23.9	45.6
98	7.1	37.1	8.3	31.2	1.5	22.9	7.9	32.1	10.9	65.9
99	4.4	24.4	12.5	31.8	14.9	27.7	14.1	41.1	-10.0	[illegible]
100	32.4	55.2	7.6	40.9	1.5	54.3	11.0	40.8	20.5	36.5
101	4.6	35.7	14.7	25.6	7.7	24.0	9.1	33.3	11.2	48.6
102	18.1	37.1	5.5	49.5	11.9	35.8	.2	21.1	8.1	31.8
103	6.0	17.9	6.5	18.6	2.4	33.8	-10.0	52.3	.7	36.0
104	.1	24.6	7.5	37.1	5.1	56.4	21.0	33.7	19.5	39.3
105	29.1	40.1	8.6	60.3	9.2	68.0	23.7	37.9	15.1	38.4
106	4.9	21.3	6.7	54.9	21.4	58.2	8.2	23.5	.9	44.3
107	11.7	29.6	5.4	26.2	-10.0	54.0	1.9	29.8	5.8	42.9
108	3.6	30.5	5.8	54.9	.8	40.7	27.2	38.6	22.9	52.3
109	13.6	39.5	7.9	32.5	7.4	49.2	6.3	27.7	1.8	45.1
110	8.9	36.0	16.0	47.7	11.1	30.0	6.0	45.9	15.8	28.9
111	10.4	28.9	-10.0	35.4	3.0	70.0	25.2	46.6	0.0	19.5
112	8.3	26.4	12.4	34.8	2.1	18.5	.2	35.0	12.5	29.8
113	2.8	26.8	2.8	17.3	5.7	39.5	.2	44.0	21.5	49.0
114	9.3	56.5	15.8	30.6	5.0	42.6	9.1	39.2	12.9	32.2
115	-10.0	25.9	8.4	7.0	14.6	39.9	13.9	45.7	6.0	42.8
116	6.1	29.7	7.9	33.7	14.4	41.2	21.9	56.4	10.7	40.2
117	2.7	49.3	34.3	48.0	6.0	26.1	9.3	29.9	7.6	15.9
118	-5.5	38.4	11.0	28.7	6.7	28.7	1.7	24.9	-10.0	15.1
119	4.4	35.9	21.0	34.3	5.7	47.2	2.5	25.5	4.9	42.8
120	21.7	32.0	15.0	69.2	11.9	53.0	15.5	38.1	5.1	50.6
121	13.2	37.0	10.7	33.0	8.6	35.4	15.2	46.3	22.9	72.6
122	14.8	35.3	5.6	43.2	3.0	22.0	-10.0	39.2	0.0	12.5
123	1.1	39.4	11.0	28.7	6.9	27.6	14.6	42.6	12.0	47.5
124	3.7	44.8	4.7	21.1	.8	47.3	6.6	21.0	3.0	29.4

*% of DLS

Fighter Air-To-Ground Mission (Continued)

125	2.6	24.[illegible]	5.1	65.0	.7	21.5	.1	46.8	.1	37.1
126	3.9	38.7	1.0	27.1	-10.0	19.6	3.0	35.4	18.7	37.2
127	0.0	25.1	1.9	45.5	2.0	37.2	10.2	27.7	3.4	44.6
128	32.6	45.9	8.9	35.1	15.4	51.3	23.2	54.1	.2	40.2
129	8.9	61.9	1.6	7.0	43.9	65.0	6.5	31.6	.3	25.9
130	3.8	57.9	-10.0	40.8	30.1	49.7	9.7	40.5	17.9	31.0
131	.8	47.9	10.4	24.1	2.1	13.9	1.2	17.1	3.9	52.1
132	36.8	53.2	-.2	65.2	13.3	30.8	3.7	39.2	4.3	47.5
133	15.8	46.3	15.3	33.9	9.2	43.1	6.4	49.6	5.6	33.3
134	-10.0	31.4	.2	24.1	13.4	42.0	23.1	66.0	-2.5	13.3
135	1.4	34.3	11.2	45.2	9.6	40.2	.9	30.7	11.2	47.7
136	1.1	40.6	13.2	30.6	6.0	30.2	.4	67.9	17.4	37.5
137	14.1	46.3	7.4	29.1	7.6	24.[illegible]	21.6	40.2	-1[illegible].7	2[illegible].1
138	8.5	55.8	27.1	48.0	2.9	31.0	8.0	22.0	3.6	63.9
139	4.1	50.7	11.4	60.9	-.7	46.1	5.7	20.5	.3	46.6
140	3.3	25.5	-.2	70.2	2.0	32.4	19.8	31.5	12.0	34.3
141	1.3	33.5	19.1	44.1	9.7	55.8	-10.0	40.0	4.6	25.5
142	8.3	45.3	10.4	35.9	9.3	32.7	6.0	64.3	19.7	47.0
143	13.4	37.0	8.6	42.4	6.3	45.4	16.5	30.2	15.8	58.0
144	7.1	49.5	11.5	74.8	8.5	34.8	11.9	48.8	5.2	71.6
145	28.4	50.1	3.6	28.8	-10.0	44.1	10.1	58.0	11.3	52.7
146	20.4	33.3	17.6	46.8	11.2	45.2	18.0	31.4	1.8	50.0
147	6.4	20.3	6.3	48.5	2.9	35.9	4.3	27.5	13.0	23.6
148	-10.2	20.2	3.6	24.5	12.3	28.6	13.0	29.5	14.1	36.1
149	.3	49.9	-10.0	53.1	10.7	50.9	8.4	41.6	15.0	29.9
150	9.7	47.0	14.6	41.9	21.7	35.9	7.3	52.3	.7	45.0
151	2.7	26.0	7.0	29.6	2.5	34.6	6.8	40.4	6.8	36.3
152	9.0	29.4	4.2	38.4	1.3	16.4	-1.4	15.8	4.4	29.2
153	-10.0	21.[illegible]	2.0	32.3	.2	50.4	5.9	55.7	7.2	20.8
154	6.5	40.2	17.1	35.5	9.1	22.5	11.5	77.7	5.5	32.4
155	10.3	41.3	1.7	59.7	3.2	25.4	5.6	23.3	6.7	76.7
156	7.5	23.4	6.1	38.6	11.5	63.2	2.2	18.1	-10.0	35.0
157	1.4	48.8	35.1	63.2	4.2	28.4	-.1	21.6	1.9	48.6
158	12.7	56.1	19.4	35.1	-2.3	60.0	10.8	25.4	3.0	39.5
159	1.3	25.7	12.2	32.9	8.9	19.4	5.4	29.0	0.0	41.3
160	7.8	24.0	10.4	37.0	0.0	25.7	-10.0	33.5	18.2	58.0
161	11.5	32.[illegible]	2.3	45.4	16.5	29.8	.[illegible]	44.9	.1	59.7
162	8.2	30.9	.3	49.1	8.7	37.5	17.9	34.3	7.5	47.2
163	24.7	37.9	-3.1	32.4	14.9	60.1	28.6	68.8	14.3	27.8
164	7.6	39.5	3.9	53.3	-10.0	31.5	11.9	63.2	15.4	68.5
165	15.6	34.7	2.5	28.3	1.2	19.0	4.0	67.3	11.1	34.9
166	4.6	27.3	15.6	64.3	20.4	32.3	6.0	32.6	21.3	55.6
167	24.5	54.4	.6	24.2	2.5	20.8	6.5	41.4	2.4	41.7
168	11.9	44.9	-10.0	24.8	14.3	34.5	17.0	35.1	14.4	62.1
169	23.5	43.5	6.5	54.4	9.5	71.3	2.3	36.5	9.9	26.7
170	1.7	36.4	16.4	39.2	1.0	38.0	24.6	37.2	0.0	28.5
171	7.3	27.4	15.5	35.2	14.5	36.9	3.3	44.8	2.6	51.0
172	-10.0	37.2	9.5	27.1	3.3	26.1	6.5	26.6	10.6	24.1
173	13.7	49.1	-.5	51.4	6.2	53.0	9.9	38.4	5.7	25.3
174	13.8	59.9	7.9	20.8	0.0	16.7	4.3	33.0	-1.2	23.2
175	.4	14.2	3.7	56.0	1.2	52.7	29.8	42.2	-[illegible]	15.7
176	.3	63.3	16.5	30.5	3.2	34.5	1.9	62.[illegible]	1.4	29.8
177	-1.7	34.0	2.7	56.3	33.3	47.5	.7	25.5	12.3	42.1
178	9.9	21.3	10.9	42.6	18.5	49.1	26.2	40.4	12.0	39.5
179	4.6	43.3	12.0	44.5	7.4	33.8	-10.0	36.2	.5	15.6
180	-.9	40.9	-.6	28.6	3.9	17.0	.1	52.9	-1.1	25.4
181	11.1	41.3	5.2	32.8	3.7	30.0	0.0	43.7	8.6	38.1
182	5.3	50.0	1.7	17.1	.3	20.2	6.5	39.3	20.3	34.3
183	4.4	17.1	3.0	56.9	-10.0	35.3	5.8	73.5	16.2	46.3
184	7.4	34.0	.4	69.5	1.6	36.0	2.3	36.5	18.5	35.4
185	1[illegible].5	34.4	8.9	6.3	4.7	59.5	14.5	43.8	.7	77.8
186	17.0	36.6	6.7	58.9	21.8	59.5	3.8	43.1	-.4	43.4

★% of DLS

Fighter Air-To-Ground Mission (Continued)

AD-A118 965 ROCKWELL INTERNATIONAL EL SEGUNDO CA NORTH AMERICAN --ETC F/G 9/2
A USER'S MANUAL FOR A COMPUTER PROGRAM TO PREDICT FATIGUE CRACK--ETC(U)
NOV 81 J B CHANG, M SZAMOSSI, K LIU F33615-77-C-3121
UNCLASSIFIED NA-81-258 AFWAL-TR-81-3094 NL

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187	22.6	33.8	-10.0	26.5	9.4	40.2	2.1	56.5	7.2	40.2
188	3.5	22.5	10.7	21.3	4.8	70.5	25.5	45.3	.1	22.5
189	9.2	57.0	7.0	29.0	6.6	45.1	-.4	69.6	4.7	37.5
190	6.0	37.7	27.3	40.4	11.5	25.1	6.5	28.1	11.5	57.0
191	-10.0	56.9	19.4	32.7	8.3	22.5	7.9	35.9	11.6	46.4
192	26.2	40.1	4.7	41.5	6.4	59.2	4.2	42.4	19.2	35.5
193	7.8	22.1	0.0	13.4	1.2	41.4	-2.5	16.1	5.8	43.6
194	11.2	36.9	1.6	73.6	12.0	45.5	11.3	54.4	-10.0	25.7
195	.2	37.7	.2	27.6	16.5	56.5	8.8	38.5	0.0	37.4
196	5.0	50.3	4.6	17.3	.4	41.4	5.1	26.8	7.8	30.0
197	2.7	34.8	5.7	19.2	5.1	36.4	17.5	54.9	.4	32.4
198	13.2	54.0	13.2	35.2	6.4	29.6	-10.0	49.6	.2	15.8
199	.3	42.8	16.8	39.6	15.0	37.2	4.3	30.2	12.5	46.4
200	21.3	44.9	2.6	41.1	12.4	50.3	10.8	26.8	6.1	60.1
201	15.1	38.1	4.2	36.7	2.5	34.6	16.4	26.5	15.2	51.6
202	1.0	38.4	8.3	29.3	-10.0	53.2	1.9	34.1	-.2	49.6
203	9.4	38.9	17.5	34.5	.3	43.4	0.0	45.2	33.3	45.0
204	2.4	24.2	7.4	47.2	2.9	25.1	2.1	46.4	4.7	53.3
205	23.9	41.2	7.3	26.1	10.8	27.0	2.3	58.9	10.5	27.8
206	12.5	32.0	-10.0	27.4	10.6	56.5	10.5	26.2	5.6	29.9
207	17.8	59.4	-1.3	62.9	10.3	46.6	10.8	26.6	8.1	47.9
208	33.6	61.3	8.6	28.3	1.9	23.5	2.7	24.4	6.0	34.9
209	22.4	40.6	29.2	42.4	3.9	26.8	.6	49.0	1.8	14.3
210	-10.0	26.5	1.2	45.6	6.5	42.0	1.9	14.7	3.7	17.3
211	1.3	15.1	.4	49.9	0.0	29.1	14.1	24.8	-1.4	58.6
212	.7	34.5	13.1	26.8	5.6	30.6	15.3	39.3	.8	21.7
213	4.6	55.9	4.7	67.7	-4.3	41.4	21.2	54.2	-10.0	37.5
214	4.9	38.3	3.4	47.1	1.7	37.8	3.7	52.7	14.9	35.9
215	14.7	32.7	5.4	42.5	2.6	48.8	7.3	44.2	12.4	40.0
216	2.7	41.7	2.2	34.6	19.6	32.6	7.8	35.2	3.2	49.9
217	.7	50.2	9.9	39.8	4.8	38.1	-10.0	37.5	12.7	38.7
218	4.3	31.7	12.3	71.3	-1.9	53.4	31.4	41.6	1.8	51.2
219	9.8	35.0	15.5	60.4	1.7	28.0	14.2	48.8	15.3	32.9
220	16.3	43.1	4.4	32.3	-.2	30.5	16.1	32.5	10.1	42.6
221	12.7	34.3	-.8	34.0	-10.0	52.1	16.2	36.6	22.5	41.2
222	-.1	44.6	13.3	38.0	20.9	34.7	-.1	24.0	10.2	36.4
223	17.9	58.2	3.6	37.3	2.8	15.5	3.7	48.5	22.5	45.2
224	6.1	19.5	1.3	24.7	11.7	37.0	2.7	44.8	6.6	26.9
225	1.1	50.2	-10.0	38.8	21.2	34.9	10.1	27.4	4.3	40.7
226	27.7	52.7	2.1	38.4	8.6	33.9	18.8	32.4	2.9	28.9
227	1.3	47.8	1.3	17.0	1.8	31.0	16.6	35.0	-.7	25.5
228	10.9	62.7	6.3	28.5	2.3	48.5	20.2	36.8	6.0	26.3
229	-10.0	44.7	15.5	43.4	12.8	24.9	6.4	38.0	1.5	32.0
230	17.2	56.8	4.7	21.5	.4	25.4	7.4	20.0	8.3	32.4
231	17.7	53.4	-.5	28.0	3.5	55.2	13.4	37.6	5.7	15.5
232	1.2	34.8	10.6	26.7	4.5	39.4	.1	63.4	-10.0	79.7
233	2.7	21.6	0.0	13.5	1.2	60.9	0.0	14.0	3.5	33.6
234	12.7	52.3	5.0	41.4	3.6	38.7	15.4	55.4	2.0	50.4
235	9.9	47.7	24.6	40.8	4.8	39.4	5.6	34.6	1.9	31.0
236	13.7	25.0	.4	36.0	6.8	38.6	-10.0	32.6	8.7	45.6
237	0.0	37.2	15.3	33.7	14.0	49.7	19.1	31.2	5.8	52.6
238	15.6	20.6	-.1	42.2	2.6	19.3	5.7	48.2	9.9	29.7
239	5.1	21.5	4.3	32.0	7.6	40.1	11.8	52.3	5.7	24.9
240	10.7	36.8	2.6	20.0	-10.0	34.6	1.7	22.6	4.4	36.4
241	10.2	30.6	.2	14.7	2.4	50.8	16.3	38.5	.2	21.6
242	5.4	29.0	.7	25.5	3.5	61.2	1.0	41.3	3.2	27.5
243	.5	62.9	8.6	28.6	14.1	32.3	7.4	45.7	17.3	53.9
244	3.2	26.2	-10.0	26.2	5.5	38.7	3.7	53.5	8.3	32.5
245	7.8	39.1	1.1	41.9	0.2	38.9	3.5	41.9	12.3	26.2
246	-3.6	18.4	8.2	54.9	2.1	31.2	11.0	26.8	1.4	35.4
247	13.8	27.8	7.6	35.2	12.2	78.6	12.7	30.6	5.7	37.7
248	-10.0	40.7	7.7	41.6	14.2	41.4	8.3	29.8	10.4	32.2

★% of DLS

Fighter Air-To-Ground Mission (Continued)

249	16.9	61.9	2.4	27.7	8.5	31.3	15.3	29.0	5.2	[illegible]
250	17.0	64.7	20.7	42.9	11.2	27.7	5.4	23.9	4.0	24.1
251	9.5	31.9	15.3	47.4	14.7	33.6	12.4	29.1	-10.0	37.1
252	22.9	48.3	-.7	36.4	10.2	30.8	10.3	45.3	16.5	37.1
253	3.9	41.3	[illegible]	[illegible]	2.7	20.7	5.6	[illegible]	[illegible]	[illegible]
254	18.6	44.2	2.7	37.6	11.6	44.5	11.6	69.7	19.1	37.7
255	7.6	24.9	3.0	27.2	8.6	34.6	-10.0	31.8	7.6	32.5
256	17.9	33.4	11.6	39.1	6.8	31.9	8.9	23.1	11.2	28.4
257	6.7	30.4	11.5	40.6	1.7	27.1	6.1	30.1	8.8	31.6
258	7.5	50.5	2.1	26.9	12.3	46.7	12.9	26.5	4.3	36.3
259	15.8	40.2	7.4	27.0	-10.0	56.1	8.2	45.9	12.4	54.7
260	3.0	26.4	9.7	33.0	8.5	50.6	2.6	29.2	-.8	16.0
261	1.1	44.4	16.8	34.1	1.3	41.6	.1	47.9	.7	39.5
262	19.1	28.4	0.0	20.2	.1	48.6	8.7	20.2	4.7	49.7
263	10.9	44.5	-10.0	21.3	.6	34.7	.6	30.5	5.4	39.5
264	5.9	39.8	18.6	45.0	22.9	35.6	-.5	41.7	.8	21.2
265	8.0	29.2	5.5	51.9	3.5	56.9	-2.3	38.3	2.3	41.2
266	17.7	51.8	10.4	48.0	-.1	42.5	29.1	40.5	.2	57.6
267	-10.0	26.8	4.8	36.8	21.4	68.7	2.4	25.3	[illegible]	52.2
268	15.5	40.3	.7	30.0	5.6	63.1	14.5	41.9	1.1	41.8
269	21.2	35.0	5.4	39.3	12.8	53.1	-2.1	68.6	3.0	55.5
270	2.4	63.9	16.0	54.2	4.5	59.5	32.6	43.0	-10.0	30.6
271	19.9	52.9	14.0	58.6	10.1	24.3	5.9	27.2	1.2	21.4
272	6.8	40.9	5.0	36.9	.5	32.2	1.8	43.9	7.8	23.4
273	12.4	34.1	8.9	40.9	7.3	71.6	3.8	18.4	4.6	29.2
274	13.4	69.4	7.5	39.6	1.3	26.0	-10.0	70.3	35.3	46.5
275	1.8	73.2	5.2	27.7	2.3	39.2	13.4	40.0	11.5	43.4
276	1.8	33.4	11.3	23.3	3.0	18.6	3.4	35.9	12.5	42.9
277	-.1	67.9	3.7	62.9	-.7	41.7	12.7	33.5	10.5	25.8
278	15.1	39.8	2.0	47.5	-10.0	42.8	28.2	40.5	13.4	36.3
279	14.9	53.2	2.1	52.7	33.7	59.0	23.1	34.3	-4.0	17.1
280	4.7	20.1	3.7	50.3	19.8	36.6	5.7	18.6	6,7	55.4
281	17.2	31.8	6.2	54.9	29.9	54.6	17.5	44.3	10.9	42.2
282	10.2	43.6	-10.0	43.6	15.8	46.3	17.0	56.1	15.3	56.7
283	21.2	44.5	9.4	32.5	15.5	56.2	14.4	28.7	6.8	34.3
284	7.6	37.0	-.8	50.1	.6	37.5	9.5	41.0	2.8	55.6
285	17.9	29.4	-6.0	32.3	5.6	27.9	6.2	42.0	7.8	23.4
286	-10.0	45.6	5.2	42.8	5.9	35.7	17.8	33.6	1.1	45.9
287	4.1	31.6	9.6	37.4	17.1	51.9	6.1	22.3	7.0	29.2
288	9.9	29.5	14.1	42.2	1.3	32.0	9.0	50.2	1.2	25.2
289	13.5	31.9	4.2	42.0	1.3	46.7	.4	42.0	-10.0	49.1
290	3.9	65.4	13.3	52.3	18.5	35.2	5.8	49.1	34.6	46.4
291	6.5	38.4	3.4	53.3	-.3	78.2	21.6	47.9	1.9	18.6
292	3.6	23.0	1.5	45.7	2.3	44.8	2.9	17.9	-1.7	36.2
293	18.8	36.2	7.0	27.0	2.9	39.3	-10.0	61.7	19.0	36.3
294	7.0	41.4	16.4	27.9	16.5	32.1	17.2	27.8	4.2	43.2
295	9.1	23.0	5.4	32.3	8.1	30.7	.4	24.0	1.8	32.9
296	3.0	30.7	17.1	35.6	11.1	34.9	.2	42.9	23.8	37.5
297	7.5	29.5	1.9	31.4	-10.0	41.3	29.5	39.7	[illegible]	20.1
298	4.3	45.7	31.6	57.5	5.1	15.1	-.1	53.4	.3	23.7
299	5.2	47.2	1.4	38.5	18.5	41.6	10.2	30.4	6.1	42.7
300	24.2	44.9	10.8	31.0	7.7	65.3	23.6	33.8	3.6	21.7
301	6.7	50.1	-10.0	54.0	11.5	28.6	3.2	42.9	29.1	39.5
302	22.3	40.1	2.0	36.6	4.9	20.3	0.0	53.2	4.8	43.3
303	7.1	42.4	16.3	54.4	4.5	45.9	-2.0	28.7	4.6	62.9
304	3.6	51.1	10.9	38.6	10.7	46.0	18.5	37.5	3.0	13.4
305	-10.0	[illegible]	[illegible]	[illegible]	1.0	33.3	3.2	33.3	17.3	[illegible]
306	1.4	45.2	14.8	32.3	14.4	29.5	2.0	44.4	10.5	46.4
307	.2	43.3	6.1	47.8	8.9	21.6	4.1	24.6	4.5	32.6
308	3.2	38.8	14.1	34.7	-.4	41.0	13.3	32.8	-10.0	29.4
309	3.5	23.5	13.3	30.6	2.6	47.2	5.3	26.8	7.3	27.1
310	8.1	45.1	12.1	27.4	-.6	49.8	5.3	36.7	13.5	31.9

*% of DLS

Fighter Air-To-Ground Mission (Continued)

311	11.7	43.3	13.6	29.0	8.9	31.3	1.3	35.9	16.4	51.8
312	18.3	37.2	14.3	31.4	16.6	47.3	-13.0	45.6	27.4	36.2
313	14.1	42.1	7.1	26.0	11.1	57.5	16.1	34.4	6.4	25.9
314	2.3	49.3	24.9	43.5	17.8	37.2	21.6	55.6	18.7	29.7
315	6.8	17.3	.1	29.0	6.3	44.2	19.4	36.1	.5	37.3
316	4.3	29.2	8.9	22.2	-10.0	28.8	18.2	36.8	6.5	48.0
317	17.3	51.7	-.1	52.5	20.2	34.5	3.2	37.8	8.2	22.9
318	1.0	41.0	1.4	16.4	.4	40.8	5.7	28.2	.3	36.0
319	11.6	27.3	13.3	24.0	6.1	40.3	2.9	63.9	5.5	38.3
320	.3	52.5	-10.0	24.3	11.5	48.2	3.0	32.6	6.6	43.0
321	11.6	28.1	1.2	39.2	28.0	38.7	5.8	25.5	1.3	38.8
322	16.0	47.7	2.6	43.1	6.5	30.4	2.4	23.0	8.3	36.9
323	20.3	39.7	15.3	30.9	6.3	38.4	7.4	38.5	22.4	62.3
324	-10.0	38.7	23.2	41.0	6.1	32.4	2.6	40.8	16.9	57.0
325	.8	14.2	.1	53.9	5.6	29.0	11.9	52.1	19.2	63.2
326	3.2	26.3	1.8	39.5	14.4	32.7	18.9	30.4	14.4	54.9
327	8.3	54.8	24.3	60.4	14.2	45.2	-2.1	21.2	-10.0	23.1
328	9.2	57.2	10.0	22.8	9.1	53.4	0.0	26.0	11.4	58.2
329	1.9	18.4	4.3	37.5	19.6	38.9	.9	41.7	7.3	28.5
330	10.5	43.8	14.3	29.6	1.6	39.9	10.4	51.6	11.2	58.3
331	8.9	64.6	7.1	71.5	24.9	53.0	-10.0	35.8	5.5	57.7
332	8.4	39.1	1.2	36.8	7.3	22.2	4.3	26.6	5.3	32.0
333	10.9	34.3	6.1	26.3	10.5	24.3	-.3	19.9	9.7	19.8
334	4.3	24.2	4.5	43.4	16.3	29.4	10.5	45.8	26.1	39.9
335	19.4	42.3	4.7	36.7	-10.0	36.4	6.0	35.6	3.7	46.7
336	6.7	45.4	21.7	48.9	4.4	26.8	9.3	55.4	22.5	43.6
337	.4	37.2	16.5	30.1	14.1	34.4	.2	31.7	4.9	33.8
338	22.1	52.6	24.4	44.2	.8	24.0	10.7	66.8	-4.7	50.0
339	21.0	61.1	-10.0	41.5	9.0	22.2	13.0	20.1	7.3	33.0
340	2.7	27.8	9.9	28.6	8.1	28.4	13.6	35.4	9.3	25.8
341	12.6	70.4	19.3	32.2	-2.6	57.2	-2.0	31.1	1.2	41.2
342	13.9	29.5	10.4	27.7	3.4	49.1	7.8	24.6	8.9	71.1
343	-10.0	32.8	13.5	32.8	2.6	20.8	7.8	23.4	15.8	33.9
344	16.7	27.3	8.7	43.2	1.8	15.1	-2.2	25.2	.2	15.9
345	2.5	33.5	-.6	29.4	8.7	26.3	3.6	21.8	11.4	47.8
346	26.8	40.5	4.1	43.1	2.4	40.5	7.0	34.9	-10.0	24.9
347	5.8	59.7	32.9	56.7	1.3	31.5	12.9	25.8	13.0	34.5
348	3.5	40.6	22.3	34.0	13.8	34.3	19.1	56.7	2.0	71.6
349	3.4	42.1	16.1	31.4	5.2	40.0	2.1	48.1	24.4	38.4
350	12.7	38.2	11.0	28.9	7.3	52.5	-10.0	29.8	14.9	26.4
351	3.9	42.0	6.2	39.3	18.9	32.2	5.4	19.7	8.3	35.4
352	19.0	46.8	-.6	42.5	23.9	44.2	10.1	40.9	10.1	28.3
353	14.4	29.3	4.0	39.2	16.0	34.3	19.2	33.7	5.9	29.5
354	16.9	42.6	16.6	43.3	-10.0	38.8	2.7	62.4	2.9	26.2
355	4.9	42.6	15.0	39.4	.7	21.1	2.7	44.4	17.0	49.3
356	.7	26.6	.4	26.7	6.3	44.8	4.7	55.0	6.2	31.3
357	9.7	37.4	14.9	32.0	6.0	56.4	4.4	31.6	15.1	36.5
358	10.1	36.3	-10.0	47.9	9.9	24.5	4.5	39.6	6.8	23.2
359	.1	47.8	5.6	36.7	4.8	30.0	5.0	45.5	31.5	42.7
360	-2.2	26.1	4.7	47.1	4.8	55.3	17.1	28.7	5.2	25.1
361	9.3	39.2	11.3	47.4	0.0	31.2	18.6	30.0	5.5	61.5
362	-10.0	24.4	.7	41.3	3.0	44.1	.9	27.6	7.9	43.5
363	11.0	29.4	10.6	33.3	5.3	37.4	11.1	46.1	34.7	57.3
364	-.2	49.3	20.6	58.1	22.0	33.3	19.8	32.7	7.6	76.6
365	1.5	36.4	1.6	49.8	10.8	47.4	13.0	32.7	-10.0	46.8
366	16.1	35.1	-2.8	30.4	4.0	62.3	11.6	26.3	6.9	28.2
367	11.1	49.7	18.3	43.1	.5	30.4	11.5	46.9	1.5	45.7
368	4.8	31.3	5.4	51.8	7.7	49.7	25.6	39.5	6.3	27.0
369	12.5	41.0	2.5	45.6	2.5	49.4	-10.0	33.7	15.9	41.7
370	-.1	33.9	18.3	35.1	17.9	41.8	27.3	38.1	6.5	49.3
371	27.9	40.9	6.1	39.5	5.1	34.9	8.5	23.0	6.3	44.3
372	2.9	20.2	.1	49.3	-5.0	27.7	14.2	43.6	19.2	48.1

★% of DLS

Fighter Air-To-Ground Mission (Continued)

373	1.4	41.0	-.5	35.5	-10.0	34.1	2.1	48.5	23.1	46.2
374	7.3	39.1	6.0	43.7	17.2	33.1	.6	26.4	16.2	28.5
375	11.4	44.5	19.6	60.0	9.1	22.7	6.1	25.6	9.8	39.2
376	0.0	59.2	8.1	42.1	0.0	70.9	12.1	25.5	0.0	34.9
377	1.0	68.8	-10.0	37.0	1.9	50.8	20.1	34.5	14.6	51.0
378	.2	40.3	15.1	42.5	.8	59.8	2.4	73.6	9.6	26.6
379	6.7	36.4	8.0	21.7	11.3	29.6	10.1	20.7	10.1	51.8
380	17.7	38.8	3.8	20.9	4.0	16.9	5.7	24.2	8.0	31.8
381	-10.0	40.8	-.1	36.2	16.8	54.0	16.5	54.3	11.6	44.8
382	5.3	25.2	-3.0	38.7	27.5	50.7	17.0	33.4	-.1	41.3
383	28.0	70.0	0.0	79.5	26.7	45.6	11.0	38.0	6.9	24.6
384	1.0	33.6	11.7	29.8	9.3	19.9	3.2	26.6	-10.0	32.8
385	3.8	28.7	-.1	43.2	9.8	34.9	12.8	23.0	-.3	26.2
386	-1.5	40.9	7.6	41.2	6.5	30.1	.9	32.3	11.9	42.0
387	9.0	30.6	3.7	60.4	5.3	17.1	2.1	27.3	.3	48.0
388	12.4	48.7	12.7	41.2	6.5	41.4	-10.0	61.8	-.9	32.8
389	1.6	43.2	14.9	32.3	6.8	16.9	1.6	32.7	10.6	30.3
390	3.9	31.4	18.0	31.7	12.0	47.4	6.0	26.0	8.9	35.3
391	7.1	51.7	0.0	41.3	14.1	27.7	7.1	63.1	2.0	40.5
392	5.1	26.6	-11.4	65.2	-10.0	43.9	29.7	42.6	3.0	21.4
393	10.5	53.0	4.4	69.5	4.7	42.9	3.1	32.4	3.3	43.0
394	24.1	43.0	25.4	46.1	5.1	39.6	0.0	44.0	28.5	40.4
395	10.7	40.9	19.6	38.0	19.0	29.5	9.2	29.3	12.6	29.6
396	2.7	60.6	-10.0	48.2	19.5	49.4	-2.3	46.7	13.1	28.0
397	2.9	18.7	-2.5	20.5	4.4	18.3	5.2	25.2	10.5	52.4
398	2.1	22.0	6.4	23.6	8.7	42.7	23.4	61.9	1.3	15.1
399	5.0	42.1	1.6	32.2	19.1	34.8	3.8	37.9	8.3	56.2
400	-10.0	39.5	4.1	31.2	19.2	31.1	6.5	37.5	26.0	40.3
401	3.7	31.4	8.9	47.1	8.9	32.9	16.0	38.0	13.2	51.0
402	8.9	51.1	9.6	32.9	14.8	64.4	14.0	26.9	13.9	33.9
403	-.7	28.1	5.1	24.9	9.1	57.7	29.5	45.9	-10.0	40.3
404	2.3	49.7	3.2	21.3	6.2	34.9	2.6	43.2	23.1	33.2
405	16.4	38.1	11.2	43.1	4.9	30.4	3.5	57.4	17.6	42.4
406	-2.1	43.3	20.5	37.8	13.8	47.0	1.1	41.7	3.5	13.7
407	1.2	25.7	5.5	19.4	5.2	37.4	-10.0	30.0	11.4	29.5
408	6.1	58.0	34.3	74.2	13.6	31.7	1.6	25.7	10.7	34.8
409	13.7	61.8	2.4	46.1	7.4	56.8	.9	22.1	4.0	18.3
410	7.4	40.3	6.6	22.4	.3	31.3	15.6	26.1	4.7	14.8
411	3.4	38.5	9.0	60.2	-10.0	74.6	14.9	52.0	5.6	42.3
412	12.0	25.6	-.8	52.7	32.2	56.0	.7	16.9	6.8	55.7
413	23.2	38.7	27.8	38.7	11.1	44.7	9.7	40.5	14.4	43.6
414	1.3	29.5	5.7	58.8	32.4	52.5	-5.8	64.4	18.1	68.6
415	2.2	32.8	-10.0	26.5	.1	29.2	12.3	42.4	1.3	30.2
416	5.7	17.9	6.1	30.3	5.0	16.4	5.7	24.9	10.1	37.9
417	12.1	70.0	7.2	25.1	.9	62.6	-.1	14.0	2.9	72.9
418	9.7	26.6	13.4	41.1	4.3	35.2	16.0	45.5	32.0	47.0
419	-10.0	56.5	4.9	76.3	4.5	46.2	1.1	25.8	15.3	38.7
420	.5	48.5	1.7	36.8	4.4	23.0	4.5	27.2	4.1	20.3
421	6.7	25.4	-.8	46.5	1.6	15.1	4.1	32.4	7.8	39.7
422	-.9	38.1	21.2	37.0	4.4	29.5	8.0	57.1	-10.0	22.9
423	4.3	25.8	4.0	26.2	3.9	38.2	3.8	19.6	-2.8	43.3
424	22.8	34.7	1.6	34.2	5.1	33.2	3.8	17.5	4.5	70.2
425	11.1	34.0	1.2	30.1	7.6	43.1	29.9	48.2	19.2	29.4
426	-.2	46.3	28.1	46.2	3.1	40.7	-10.0	42.6	21.8	52.6
427	4.9	27.3	2.1	52.1	.1	25.6	5.5	47.4	12.3	29.7
428	7.8	29.3	1.1	24.3	11.1	68.9	11.5	47.8	7.2	23.2
429	12.9	27.8	1.0	32.1	7.5	28.9	13.7	31.5	18.8	41.4
430	1.7	70.4	-.4	36.0	-10.0	54.5	26.9	38.4	10.0	51.3
431	16.7	32.4	14.0	43.7	26.5	53.4	29.6	46.9	4.1	21.1
432	6.6	55.6	7.3	24.1	4.1	59.4	8.1	25.7	2.4	16.0
433	.4	28.7	16.6	41.6	6.7	25.5	6.9	17.4	2.1	69.3
434	9.0	34.6	-10.0	24.5	14.3	39.4	.3	39.1	.3	31.8

*% of DLS

Fighter Air-To-Ground Mission (Continued)

435	-1.6	30.9	16.8	28.3	8.2	38.5	1.0	36.1	12.8	30.1
436	12.9	26.4	-.2	34.6	-8.9	50.7	10.6	78.9	5.2	50.1
437	2.8	23.6	7.0	72.6	7.2	29.9	14.2	30.5	2.1	49.6
438	-10.0	68.8	7.1	56.5	10.8	33.1	23.1	39.9	3.0	49.4
439	9.7	70.0	5.3	55.2	32.1	42.3	15.2	25.4	1.1	36.9
440	19.1	42.4	.2	70.0	5.8	31.9	8.2	52.6	17.2	35.6
441	.1	28.8	10.3	51.3	38.5	60.3	3.0	47.0	-10.9	42.7
442	7.4	40.2	9.8	77.5	17.5	33.0	1.6	24.5	3.7	40.5
443	.5	59.0	20.3	48.6	25.4	53.7	.4	44.3	2.3	17.8
444	4.6	26.6	5.6	21.3	8.7	25.9	7.6	33.0	3.7	28.9
445	3.6	28.8	8.7	53.9	13.3	28.8	-10.0	25.8	11.6	23.0
446	3.3	26.5	5.0	62.6	0.0	21.4	.4	53.6	11.5	56.6
447	5.8	46.5	1.2	45.4	8.1	45.0	3.9	49.6	[illegible]	31.3
448	14.9	28.9	.1	54.1	6.2	24.1	.1	55.0	12.6	46.8
449	1.3	37.0	5.9	43.9	-10.0	33.9	5.2	16.6	2.2	40.8
450	-5.1	27.0	13.3	41.2	4.0	23.9	2.9	35.2	5.5	18.2
451	2.7	35.1	3.1	45.3	6.6	34.9	20.6	35.[illegible]	1.9	38.5
452	-.1	46.1	2.6	32.0	3.3	24.1	8.0	30.9	17.0	37.0
453	18.1	52.9	-10.0	56.9	1.3	64.0	-.4	50.8	4.7	33.8
454	11.8	28.4	.3	24.1	.3	38.7	7.0	22.7	5.6	38.1
455	10.7	51.8	10.0	38.5	6.4	36.8	14.9	36.7	2.2	29.9
456	-.1	32.5	.8	31.1	16.0	32.8	3.6	30.7	5.7	42.9
457	-10.0	36.9	7.6	43.1	12.2	45.6	9.8	32.7	4.6	43.4
458	28.2	40.2	20.7	66.3	.2	23.9	11.5	56.9	10.4	44.6
459	2.4	36.9	-2.3	63.6	6.7	23.4	.4	36.3	8.7	20.9
460	0.0	18.2	-1.1	37.1	-.7	51.3	7.3	30.8	-10.0	35.5
461	12.0	47.5	-.4	36.5	13.4	51.5	17.1	34.1	-2.5	58.1
462	6.3	41.0	4.2	40.6	12.6	32.1	2.4	42.4	3.5	37.6
463	7.6	45.3	5.1	62.5	19.4	35.6	3.1	43.1	11.0	55.9
464	16.5	54.5	1.0	60.4	.5	31.5	-10.0	36.0	12.9	37.5
465	16.5	31.0	16.4	54.0	5.2	26.5	9.1	27.2	13.9	31.7
466	21.5	49.3	6.3	28.5	9.1	32.1	9.1	54.8	-5.6	20.4
467	.7	32.3	8.3	31.0	16.5	49.7	11.2	27.3	0.0	24.6
468	13.7	37.4	-.2	28.1	-10.0	49.9	5.3	51.7	1.2	15.0
469	3.7	33.7	14.2	33.4	14.8	29.4	1.0	62.7	-2.3	31.8
470	5.1	60.5	6.9	35.0	1.8	55.1	.8	33.9	1.2	27.7
471	2.1	35.7	-1.4	55.1	17.5	48.3	8.0	37.3	10.1	33.0
472	11.5	30.9	-10.0	34.4	15.5	30.7	5.8	39.2	6.4	54.3
473	21.2	39.8	2.3	35.3	14.9	31.3	17.4	41.7	-.3	20.2
474	.2	61.8	-1.0	24.6	6.1	49.1	-4.3	37.2	20.9	37.4
475	8.9	39.9	7.0	49.0	6.5	35.8	8.7	47.4	.5	35.4
476	-10.0	46.4	-.3	37.3	1.1	56.5	1.2	43.7	14.1	24.9
477	3.1	46.6	21.6	36.0	1.9	31.2	14.0	31.5	-.7	39.0
478	12.0	40.5	-.1	45.4	7.4	57.2	34.9	47.2	4.5	28.9
479	10.4	21.1	2.0	50.4	14.7	46.8	3.7	14.9	-10.0	38.9
480	4.5	70.5	0.0	49.6	19.0	65.3	1.9	46.1	7.6	75.3
481	5.3	17.4	-.2	43.8	20.8	35.3	13.4	30.0	12.2	41.6
482	7.9	31.5	12.0	33.7	7.4	57.8	2.8	44.1	17.2	44.2
483	30.5	43.0	5.7	53.1	10.5	27.2	-13.3	23.1	6.8	37.8
484	12.5	44.1	9.2	34.2	2.3	56.2	-.9	30.4	11.5	32.6
485	10.0	61.3	5.3	43.2	9.7	21.5	7.4	40.3	10.2	56.8
486	25.5	35.0	.1	59.4	-1.3	24.3	8.4	23.6	7.7	21.4
487	4.9	21.6	9.5	30.9	-10.0	32.0	5.7	26.7	-2.6	43.4
488	.1	31.5	4.1	29.2	2.5	36.0	18.0	33.6	3.3	17.4
489	0.0	54.9	5.5	29.1	.9	57.7	4.1	40.7	26.2	46.4
490	13.1	69.0	.5	30.8	15.8	35.9	.3	69.2	43.1	55.8
491	14.2	26.6	-10.0	27.7	5.1	51.2	30.0	47.9	14.7	36.6
492	-.3	47.7	27.3	59.2	11.2	35.4	4.1	64.7	.8	60.5
493	3.1	31.7	20.5	39.8	12.1	53.2	10.2	52.1	16.9	55.1
494	4.9	37.3	.6	21.3	7.2	17.4	-7.1	29.3	11.5	31.3
495	-10.0	68.5	46.8	47.4	2.6	34.8	1.6	34.0	18.3	45.2
496	22.4	41.2	1.4	26.4	9.4	41.8	9.3	37.7	11.5	22.0

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Fighter Air-To-Ground Mission (Continued)

497	2.0	46.5	24.3	39.0	18.2	42.1	0.0	17.3	4.5	20.6
498	3.9	25.3	7.5	62.0	20.9	46.6	-1.7	41.1	-10.0	49.4
499	2.0	23.9	1.1	19.9	5.5	22.3	.7	22.4	2.5	18.3
500	7.2	37.4	8.3	27.8	0.0	45.5	5.3	22.8	5.6	34.4
501	1.0	19.2	6.8	27.7	.2	23.1	5.1	25.4	9.3	20.1
502	9.9	28.8	11.1	42.9	8.5	23.3	-10.0	32.7	12.8	40.6
503	14.4	37.5	1.3	60.1	1.7	13.9	-1.3	35.1	9.1	41.5
504	14.9	61.9	5.5	35.5	23.4	44.1	15.3	44.5	26.3	43.7
505	9.0	35.5	7.5	23.8	-4.5	46.5	12.0	28.6	.5	28.0
506	4.5	28.0	5.8	33.6	-10.0	43.5	22.5	41.2	4.3	39.1
507	9.7	34.7	9.9	35.9	10.4	29.7	.2	41.2	1.7	22.7
508	9.8	25.1	-4.0	50.3	3.2	21.4	2.5	35.9	-10.9	37.7
509	1.1	34.4	13.0	37.8	18.3	40.6	14.1	39.7	1.4	23.8
510	1.2	63.3	-10.0	39.2	11.7	28.4	.8	71.6	12.0	43.7
511	20.1	36.8	2.2	52.7	9.9	47.4	6.0	43.7	2.4	49.2
512	12.7	61.3	2.3	56.0	3.4	35.8	17.7	37.2	2.2	20.6
513	.2	21.1	8.5	33.0	18.3	35.6	1.4	29.8	3.4	37.1
514	-10.0	51.3	36.6	47.4	12.9	49.2	5.0	58.2	14.4	43.6
515	19.9	39.6	19.5	45.4	-.8	46.1	7.6	38.1	19.7	42.6
516	.4	38.3	18.8	32.4	3.5	24.5	3.4	47.3	31.2	42.4
517	2.9	39.8	6.1	33.4	1.9	24.2	10.6	37.4	-10.0	29.8
518	4.7	48.8	3.7	30.1	7.3	39.1	2.9	40.1	14.0	31.7
519	15.6	45.4	6.8	43.1	3.8	32.5	2.3	52.6	3.5	24.9
520	11.4	30.0	7.8	49.7	.3	58.8	8.5	45.5	14.6	32.1
521	2.9	70.4	8.5	25.3	14.7	45.1	-10.0	37.9	19.7	35.2
522	6.4	39.5	7.9	36.1	8.0	48.1	19.6	67.7	5.6	25.2
523	3.1	25.3	6.7	37.1	10.4	30.4	1.9	24.4	7.9	25.1
524	4.9	32.7	8.7	66.1	11.0	37.4	11.7	29.6	4.3	23.5
525	2.7	21.9	6.3	42.7	-10.0	53.5	15.7	40.1	.7	31.5
526	5.0	43.9	4.1	17.8	6.7	19.8	.6	46.6	6.3	30.5
527	3.6	36.5	10.3	33.6	8.5	53.1	1.9	26.7	3.9	33.6
528	10.6	39.9	12.4	34.1	10.4	46.5	17.2	32.0	15.4	46.7
529	8.9	47.4	-10.0	40.3	20.5	32.6	7.0	29.6	10.0	34.5
530	5.3	33.0	11.1	35.0	17.7	49.9	9.1	39.3	12.0	53.5
531	.9	61.3	5.8	38.9	22.8	77.2	1.1	65.2	13.6	24.5
532	9.3	67.6	-1.2	56.9	-1.0	44.3	19.5	54.9	33.5	58.3
533	10.0	49.5	.6	49.0	.5	62.3	10.5	24.9	4.0	51.5
534	[illegible]	28.0	10.0	38.6	23.0	40.8	23.3	45.4	3.5	29.1
535	8.3	52.0	6.4	44.0	1.4	32.0	8.0	42.4	13.5	39.1
536	22.7	40.5	.3	27.9	16.2	28.3	6.5	27.2	-10.0	37.9
537	.4	31.8	.3	33.8	2.2	36.5	15.6	42.6	3.1	44.1
538	21.7	42.2	1.5	25.8	.7	60.9	33.6	45.5	9.0	26.0
539	0.0	26.9	8.9	48.4	20.3	34.3	.6	29.4	18.3	47.2
540	18.6	48.5	16.8	44.8	12.4	25.8	-10.0	60.4	17.5	34.0
541	.2	31.8	2.1	37.0	-1.4	41.7	10.3	27.7	1.3	17.6
542	6.6	35.2	24.1	36.2	-.4	33.0	11.9	23.8	1.1	23.9
543	9.5	32.7	8.1	38.5	12.3	40.3	6.4	33.2	5.9	66.4
544	3.6	25.3	.2	14.1	-10.0	23.8	11.4	25.7	7.8	24.3
545	.5	32.5	1.7	20.1	9.7	46.7	11.3	41.4	.1	40.3
546	0.0	14.6	4.4	41.5	1.7	29.1	9.8	42.9	3.7	31.5
547	19.5	38.7	9.8	24.8	9.6	33.6	12.4	23.4	7.0	22.0
548	1.8	68.3	-10.0	80.0	21.2	48.2	11.9	41.6	3.9	53.5
549	29.8	71.7	36.8	49.3	6.9	62.6	1.2	29.0	1.5	44.4
550	5.0	67.3	25.0	45.6	28.4	38.6	4.9	26.4	2.0	17.4
551	3.2	20.4	1.1	41.6	7.8	29.0	2.7	32.5	10.3	28.8
552	-10.0	38.7	18.3	30.8	1.4	56.2	1.7	33.0	.2	45.6
553	12.9	41.4	.3	21.2	6.6	23.8	1.9	51.5	3.4	19.0
554	.1	20.2	4.6	37.7	8.5	24.0	5.9	54.8	11.6	23.2
555	7.8	60.6	5.7	20.6	9.2	24.9	11.6	39.2	-10.0	36.9
556	1.7	24.0	.4	24.1	3.2	16.2	2.4	29.0	0.0	61.5
557	10.9	33.3	.9	17.9	3.0	28.5	15.1	37.5	17.3	48.5
558	5.4	20.6	3.6	26.0	7.3	33.3	17.0	29.8	5.7	20.6

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Fighter Air-To-Ground Mission (Continued)

559	4.4	36.6	4.4	51.3	5.2	70.0	-10.0	37.0	10.9	25.5
560	8.3	45.5	13.9	25.4	0.0	37.1	12.3	28.7	-.1	41.8
561	11.0	63.6	2.3	46.7	7.0	40.1	14.3	47.6	[illegible]	36.5
562	15.7	29.1	6.2	33.0	21.5	41.2	7.1	39.3	28.4	40.0
563	1.7	33.3	14.5	24.7	-10.0	25.3	14.4	39.8	-.5	35.1
564	-.1	35.6	-4.4	31.5	7.0	53.2	.6	44.6	8.5	47.2
565	1.2	29.9	.9	44.6	16.8	36.2	2.1	34.6	7.4	46.8
566	.5	23.6	5.7	42.4	1.8	19.4	6.4	32.6	3.8	17.9
567	-.5	51.3	-10.0	25.7	0.0	12.6	.7	19.1	7.7	37.1
568	7.7	19.0	2.1	21.4	1.0	57.5	6.3	22.3	8.3	38.2
569	5.5	31.1	1.3	35.2	3.6	26.5	6.[illegible]	47.4	3.8	22.5
570	5.8	26.9	8.7	22.4	.6	28.3	9.7	44.8	[illegible]	59.7
571	-10.0	24.9	2.1	32.7	7.5	37.5	2.1	25.4	4.1	59.8
572	2.2	23.4	2.2	41.8	15.9	46.8	23.3	33.6	14.5	25.4
573	2.4	22.1	2.5	25.6	6.7	41.7	2.0	50.1	4.7	42.3
574	17.3	27.6	14.2	42.7	28.7	49.1	-3.4	26.8	-10.0	45.3
575	-1.0	42.8	-2.0	33.9	16.2	31.5	11.9	64.2	-.1	26.8
576	14.7	40.5	8.2	45.5	9.2	33.0	2.6	64.3	5.9	38.0
577	1.7	25.9	5.9	49.3	11.5	54.7	6.6	59.0	.1	29.2
578	9.5	22.0	7.1	45.1	9.1	22.7	-10.0	37.8	5.7	35.6
579	13.3	24.5	10.3	42.3	22.3	35.6	-1.2	26.6	11.2	27.1
580	6.7	33.6	23.2	41.0	22.9	40.5	.2	52.9	16.1	64.1
581	14.9	47.7	2.0	34.7	.4	24.5	11.4	31.0	4.5	51.1
582	17.7	32.0	4.8	20.7	-10.0	44.0	.7	41.0	6.4	41.6
583	2.1	37.4	8.3	51.2	27.8	78.1	2.8	51.2	5.5	55.2
584	11.4	28.6	6.8	31.7	1.1	36.9	6.4	20.7	.5	34.0
585	8.8	26.5	1.0	12.2	.2	50.9	5.0	45.0	6.7	35.3
586	1.0	51.4	-10.0	25.6	3.7	38.5	28.3	47.3	15.8	36.8
587	10.8	32.6	8.4	49.3	1.8	26.6	4.4	38.3	24.4	36.5
588	8.4	45.9	2.3	38.9	5.3	32.7	1.1	26.7	7.8	36.9
589	-.3	18.3	0.0	31.4	12.8	32.7	7.5	47.5	5.0	50.9
590	-10.0	45.7	-1.2	14.9	-6.4	51.0	15.1	29.0	14.0	49.3
591	7.4	28.9	1.4	32.4	2.7	43.8	17.3	35.5	20.4	52.4
592	-.6	19.1	5.2	63.9	.5	23.5	2.5	36.8	10.9	42.4
593	-.5	46.1	3.3	20.1	9.8	60.4	.2	38.6	-10.0	44.5
594	8.7	41.7	7.5	33.5	2.5	32.2	8.0	30.5	2.9	37.7
595	4.2	15.7	3.2	33.5	21.3	37.4	12.3	26.1	11.4	24.7
596	1.0	52.3	4.0	16.6	4.8	38.0	6.7	30.3	14.6	49.0
597	17.0	36.9	3.9	27.7	10.4	37.3	-10.0	38.3	[illegible]	27.7
598	.1	56.1	37.1	48.9	3.2	45.5	2.3	43.1	8.4	37.2
599	1.0	48.1	19.7	44.5	23.8	41.7	1.5	20.6	5.7	28.4
600	10.4	38.9	.1	22.6	7.9	49.8	16.9	27.0	-.1	36.4
601	12.0	45.2	20.7	55.9	-10.0	24.4	9.9	31.7	12.3	32.1
602	1.0	50.5	6.2	52.5	6.8	37.1	15.5	44.2	-2.7	20.7
603	8.8	31.1	10.6	65.7	16.9	49.5	7.3	37.0	6.1	38.4
604	11.2	58.2	8.0	47.9	7.7	62.6	32.4	55.4	12.6	31.8
605	6.1	43.0	-10.0	27.3	5.5	30.2	15.4	32.7	[illegible]	32.9
606	1.9	22.3	5.0	36.2	15.7	37.6	4.9	47.2	5.1	26.9
607	9.4	54.9	1.7	19.4	9.1	49.6	12.6	26.1	3.3	24.1
608	5.7	25.1	5.5	39.6	20.8	40.9	-.9	40.6	18.3	59.2
609	-10.0	37.3	1.2	38.3	3.5	26.6	3.5	22.8	6.6	41.1
610	1.1	28.5	4.4	42.2	9.6	34.8	-3.5	31.7	3.1	22.6
611	5.9	41.2	8.7	55.9	6.3	38.7	2.4	24.5	5.2	71.3
612	-.2	33.7	23.5	47.2	13.8	39.3	5.9	47.4	-10.0	35.7
613	23.0	48.5	0.0	37.4	2.0	23.3	4.7	25.9	6.0	52.0
614	.9	21.1	8.3	31.6	12.3	47.4	18.3	32.1	1.1	38.9
615	17.1	39.1	20.3	33.5	1.0	31.2	14.0	41.3	11.5	33.2
616	6.0	40.3	1.9	39.6	24.8	60.7	-10.0	17.0	3.8	53.5
617	17.5	47.1	3.9	19.5	4.7	35.0	14.2	52.5	18.3	28.6
618	3.7	64.5	1.2	22.3	9.2	48.5	8.9	37.0	5.4	23.4
619	3.3	34.4	6.6	47.3	5.6	28.4	11.5	27.0	[illegible]	[illegible]
620	12.3	26.2	2.8	51.3	-10.0	12.1	-.1	53.9	29.3	42.1

★% of DLS

Fighter Air-To-Ground Mission (Concluded)

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